United States
Department of
Agriculture

Forest Service

Tongass National
Forest
Stikine Area

R10-MB-327

July 1996

South Lindenberg Timber Sale(s)

Draft Environmental Impact Statement

Stikine Area

United States Department of Agriculture | Forest Service | Alaska Region Tongass National Forest | Stikine Area P.O. Box 309 Petersburg, Alaska 99833 (907-772-3841)

File Code: 1950

Date: June 24, 1996

Dear Reviewer:

Here is your copy of the Draft Environmental Impact Statement for the proposed South Lindenberg Timber Sale(s), Stikine Area, Tongass National Forest, Alaska. The Forest Service preferred alternative is Alternative 5, which would harvest 40 million board feet of timber from 1,727 acres in 51 units, including new construction of 12.4 miles of permanent road.

The comment period on the Draft EIS will be 45 days from the date on which notice of its availability is published in the Federal Register. We expect that to be July 19. That would make the deadline for comments September 3. It is very important that those interested in the project participate at this time. To be most helpful, comments on the Draft EIS should be as specific as possible and may address the adequacy of the statement or the merits of the alternatives discussed.

In addition, Federal court decisions have established that reviewers of Draft EISs must structure their participation so that it is meaningful and alerts an agency to the reviewer's position and contentions. Environmental objections that could have been raised at the Draft stage may be waived if not raised until after completion of the Final EIS. This is so substantive comments and objections are made available to the Forest Service at a time when it can meaningfully consider them and respond to them in the Final EIS.

I am the official responsible for the decision.

Please send written comments to Jim Thompson, P.O. Box 1328, Petersburg, Alaska, 99833, or call (907-772-3871) for additional information or if you would like more copies of the document. The Final EIS is scheduled to be completed by December 1996.

Sincerely,

ABIGAIL R. KIMBELL
Forest Supervisor

Enclosure

South Lindenberg Timber Sale(s)

Draft Environmental Impact Statement

Tongass National Forest - Stikine Area
USDA Forest Service
Alaska Region

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Abstract: This Draft Environmental Impact Statement describes the effects of four "action" alternative approaches and one "no action" approach to harvesting timber in the South Lindenberg study area on Kupreanof Island.

Summary

Summary

Introduction

One or more short-term timber sales are proposed on the Lindenberg Peninsula of Kupreanof Island. These sales are allowed by the Forest Plan (USDA Forest Service, 1979a; 1985-86), also known as the Tongass Land Management Plan, to maintain a supply of timber to support the economies of Southeast Alaska communities. In the 1979 Forest Plan (as amended), the South Lindenberg study area is designated as Land Use Designation (LUD) III and LUD IV. The east side of the study area (Wrangell Narrows side) has been designated as LUD III. Under this designation "emphasis is on managing for both amenity and commodity oriented uses in a compatible manner to provide the greatest combination of benefits." The west side of the study area (Duncan Canal side) has an LUD IV designation. Under LUD IV, management direction is to "provide for intensive resource use and development where emphasis is primarily on commodity or market resources." Under the Draft Forest Plan Revision (USDA Forest Service, 1991a), there are three LUDs for the South Lindenberg study area: Scenic Viewshed and Modified Landscape LUDs, on the east side of the study area, and Timber Production LUD on the west side. The Interdisciplinary (ID) Team used the most restrictive designation of the two plans in the planning and analysis of the South Lindenberg Timber Sale.

Four action alternatives and a no action alternative are considered in the EIS. Ecosystem management and alternative harvest concepts are introduced into this analysis to varying degrees under all the action alternatives

Issues

The alternatives were developed to address the significant issues identified through public scoping, state and other Federal agency involvement, and as management concerns by the ID Team that conducted the analysis for this EIS. The issues were summarized into four categories:

- issues related to timber production (timber management and economics),
- issues related fisheries (soil erosion, watersheds, and fish habitat),
- issues related to old-growth forests (wildlife; threatened, endangered, and sensitive [TES] species; and biodiversity),
- issues related to society (subsistence, recreation, and visual quality).

Alternatives Considered

Alternative 1

The No Action Alternative does not propose any further timber harvest or road construction in the South Lindenberg area beyond what has occurred previously. This alternative serves as the benchmark by which effects of all action alternatives are measured.

Alternative 2

This alternative was designed to provide a relatively cost-efficient timber harvest. Emphasis was given to accessing commercial forest land with cable logging and minimizing the amount of new road construction. Clearcutting is the silvicultural prescription proposed almost exclusively. Under this alternative 1,734 acres would be harvested in 50 units for

41.1 million board feet (MMBF) of net sawlog volume, with approximately 21 miles of new road construction.

Alternative 3

This alternative was designed to minimize the visual effects of timber harvest in areas seen from Duncan Canal and Wrangell Narrows. Emphasis was given to designing units that would achieve the Inventory Visual Quality Objectives. Under this alternative 1,725 acres would be harvested in 52 units for 40.2 MMBF of net sawlog volume, with approximately 26 miles of new road construction.

Alternative 4

This alternative was designed to protect deer population from habitat loss, particularly in known subsistence use areas. Under this alternative 1,815 acres would be harvested in 50 units, for 40.2 MMBF of net sawlog volume, with approximately 24 miles of new road construction.

Alternative 5

This alternative was designed to minimize impacts to old-growth dependent wildlife species and other biodiversity elements. To the extent possible, blocks of existing old-growth forest were maintained, harvesting of forest with known higher wildlife value was minimized, road construction was minimized, and the area of Wildlife Retention Areas (WRAs) was maximized. Under this alternative 1,727 acres would be harvested in 51 units for 40.3 MMBF of net sawlog volume, with 17 miles of new road construction.

Consequences

Each alternative provides a different mix of resource outputs that emphasizes different resource values.

Issues Related to Timber Production

Timber Management

The short-term and most obvious effect of timber sale activities would be the conversion of old-growth forest stands within the areas harvested into young, early successional timber stands. All action alternatives prescribe harvest over a similar number of acres. Alternative 3 proposes the greatest number of new road miles (26 miles) and Alternatives 5 the least (17 miles). Alternative 3 would result in the highest per-acre increase in volume class growth. Alternative 5 is most likely to have the lowest windthrow potential.

Timber Harvest Economics

All the action alternatives showed a negative estimated net value that ranges from -$62/MBF to -$95/MBF based on a mid-market analysis. Alternatives 2 and 5 are estimated to have a similar economic efficiency and are substantially more efficient than alternatives 3 and 4. An estimate of the current market value based on the recent Bohemia Mountain Timber Sale showed current net values ranging from $190/MBF to $160/MBF.

Issues Related to Fisheries

Soils

Best Management Practices (BMPs) designed to protect the long-term stability and productivity of soils have been applied to all the action alternatives. Alternatives 3, 4, and 5 would affect a similar area of high hazard soils through harvesting and road building activities, while the area of hazard soils directly affected by harvest activities would be substantially less for Alternative 2.

Watersheds and Fish Habitat

All action alternatives would pose some risk to fisheries from potential stream sedimentation and watershed degredation. However, by following BMPs and Aquatic Management Habitat Unit guidelines, effects in stream habitat and fisheries are not expected to be substantial under any of the action alternatives. Parameters used to evaluate impacts to watersheds and fish habitat include number of Class III stream miles within or adjacent to harvest units and number of road crossings. The degree of impact among the action alternatives varies by parameter.

Issues Related to Old-Growth Forests

Wildlife

Timber harvest activities, including new road construction, adversely effect wildlife in old-growth forests of Southeast Alaska through the loss and fragmentation of forest and by increasing edge habitat. Concentration of harvest units in existing areas of timber harvest and minimizing new roads preserves larger patches of undisturbed landscape and generally reduces impacts on wildlife.

Sitka black-tailed deer habitat is affected by all of the action alternatives, but impacts to deer are least under alternatives 4 and 5. Alternatives 3 and 4 propose road construction or timber harvest in the Skogs Creek watershed, which has high value for several wildlife species. Marten habitat is reduced the least under Alternative 2, but Alternative 5 would result in the least amount of new roads that provide access for trapping of marten. A network of Wildlife Retention Areas (WRAs) connected by unharvested forested corridors is proposed under all alternatives. Alternative 5 has a maximum area delineated within WRAs, whereas the WRAs are variously reduced under the other alternatives.

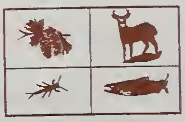
TES Species and Species of Concern

All action alternatives may result in reduced numbers of the Alexander Archipelago wolf within the South Lindenberg area due to increases in road densities and to loss and fragmentation of deer habitat. Among the action alternatives, however, Alternative 5 would have the least effect because it proposes the smallest increase in road density. Alternative 3 would have the greatest effect.

Of the three Queen Charlotte Goshawk nest sites located in the study area, all the action alternatives would adversely effect the Forging Area (FA) of the Mitchell and Duncan Creek nest sites. In addition, Alternatives 3, and 4 would effect the Skogs Creek nest site.

All action alternatives except Alternative 5 propose harvesting in areas of observed high marbled murrelet activity (Colorado Creek and Skogs Creek drainages). Under all the action alternatives the murrelet population is expected to decline in the long-term due to reduced availability of suitable old-growth nesting habitat and increased edge habitat.

Biodiversity



All action alternatives would result in loss and fragmentation of old-growth forest. No large blocks of contiguous forest (i.e., blocks greater than 1000 acres) would be broken into smaller blocks. Reductions of old-growth forest and interior old-growth forest, as well as fragmentation, would contribute to cumulative effects of previous harvesting activities but would be less in magnitude than combined previous effects

Issues Related to Society

Subsistence

As a result of all action alternatives, subsistence use of the South Lindenberg area would potentially be affected by loss of wildlife habitat and by increased access of both subsistence and non-subsistence hunters. Alternative 4 would have the least impact on Sitka black-tailed deer habitat, particularly in known subsistence use areas, however reductions in carrying capacity for deer are less than 6 percent under all alternatives. Significant restrictions in the subsistence use of deer, which are due to high hunter demand relative to the present and predicted future number of deer in the South Lindenberg area, would continue under all the action alternatives. No significant restrictions are expected on the subsistence use of bear, marten, moose, fish or shellfish.

Recreation

Implementation of any of the action alternatives would result in a varying degree of change in recreational opportunities in the South Lindenberg study area. Primitive recreational opportunities would decline, while semi-primitive non-motorized and roaded modified recreational opportunities would increase. Alternative 5 would retain the most semi-primitive non-motorized acres, followed by alternatives 2, 4 and 3.

Visual Quality

The harvest of timber and construction of roads results in the modification of seen areas under all action alternatives. Among the action alternatives, Alternative 4 would least affect the viewshed of the Wrangell Narrows, while the Duncan Canal viewshed would be affected the least under Alternative 2. Most of the harvest units would achieve the 1991 TLMP visual quality objectives (VQOs) except for units 107, 109, and 111. Units that would not achieve the Inventory VQOs (IVQOs) include the above mentioned units and units 6 and 16.

Mitigation of Consequences

The following mitigative measures would be required for implementing a timber harvest for the South Lindenberg area. The mitigative measures are applicable for all action alternatives.

- If cultural sites are discovered once the sale is in operation, protective measures will be taken under the Timber Sale Contract.

- Pursuant to the Tongass Timber Reform Act of 1990, commercial timber harvesting would be prohibited within a buffer zone no less than one hundred feet in width on each side of all Class I streams and those Class II streams which flow directly into a Class I stream. To protect downstream water quality, other Class II and all Class III streams would receive protection through a combination of directional felling of trees, partial suspension of logs, split-yarding, and removal of logging debris from stream channels.

- Full bench construction and end hauling of excavated material would be required on designated areas for soil stability and to prevent sediment from entering streams (see Road Descriptions, Appendix B).

- Group selection, reserve tree clumps, and snag retention would be implemented to help maintain wildlife habitat, structural diversity, biodiversity, and visual quality (see Unit Descriptions, Appendix A).

- For confirmed active nests of great blue herons, a 300-foot windfirm buffer will be maintained (not harvested) around the nest.

- For Queen Charlotte goshawk, timing restrictions will be put in place within 1/8 miles of a confirmed active nest to prevent mechanical disturbance (such as helicopter fly overs) associated with the timber sale.

- After use, temporary roads would be closed, water bars added at appropriate places, and drainage structures removed.

- Timing restrictions on in-stream road construction work would be implemented during critical periods to protect fishery resources (see Road Descriptions, Appendix B).

- Stream crossings of Class I and II streams would be constructed to allow fish passage.

- Partial suspension during log yarding would be required in designated harvest units to reduce soil disturbance, thus maintaining soil productivity and soil transport to streams (see Unit Descriptions, Appendix A).

- Bridges would be installed at designated stream crossings to minimize the amount of sediment entering stream channels (see Road Descriptions, Appendix B).

- To ensure that group selection units are harvested in a manner that reduces visual impacts to the greatest extent possible, a landscape architect will be involved in the planning of the unit layout and will be present on-site to give guidance during harvesting.

- If potential rock pits located near Mountain Point (Road 43520 Milepost 2.87 and 2.98) are to be developed, a landscape architect will be involved in the planning and design of the rock pit.

- Under all the action alternatives, unless used for future management activities, a road would be allowed to return to alder growth. Temporary roads would be blocked, pipes pulled, water barred and allowed to return to alder growth.

Alternative Preferred by the Forest Service

After reviewing all resource impacts, consequences, and opportunities, Alternative 5 was identified as the preferred alternative. As with all the action alternatives, Alternative 5 meets the purpose and need of the proposed South Lindenberg Timber Sale(s). Compared to the other action alternatives, Alternative 5 is relatively cost efficient and best balances impacts to other resources. In particular, Alternative 5 has the least overall impact to wildlife, fisheries, and biodiversity.

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Purpose and Need

Chapter 1

Purpose and Need

Introduction

Proposed Action

The Stikine Area of the Tongass National Forest proposes to sell approximately 40 million board feet (MMBF) of commercial timber within the South Lindenberg area on Kupreanof Island including construction of an associated road system (Figure 1-1). The timber would be sold in one or more timber sales planned to begin in 1997, and it would be transported to salt water via the existing Tonka Log Transfer Facility.

Purpose and Need for Proposed Action

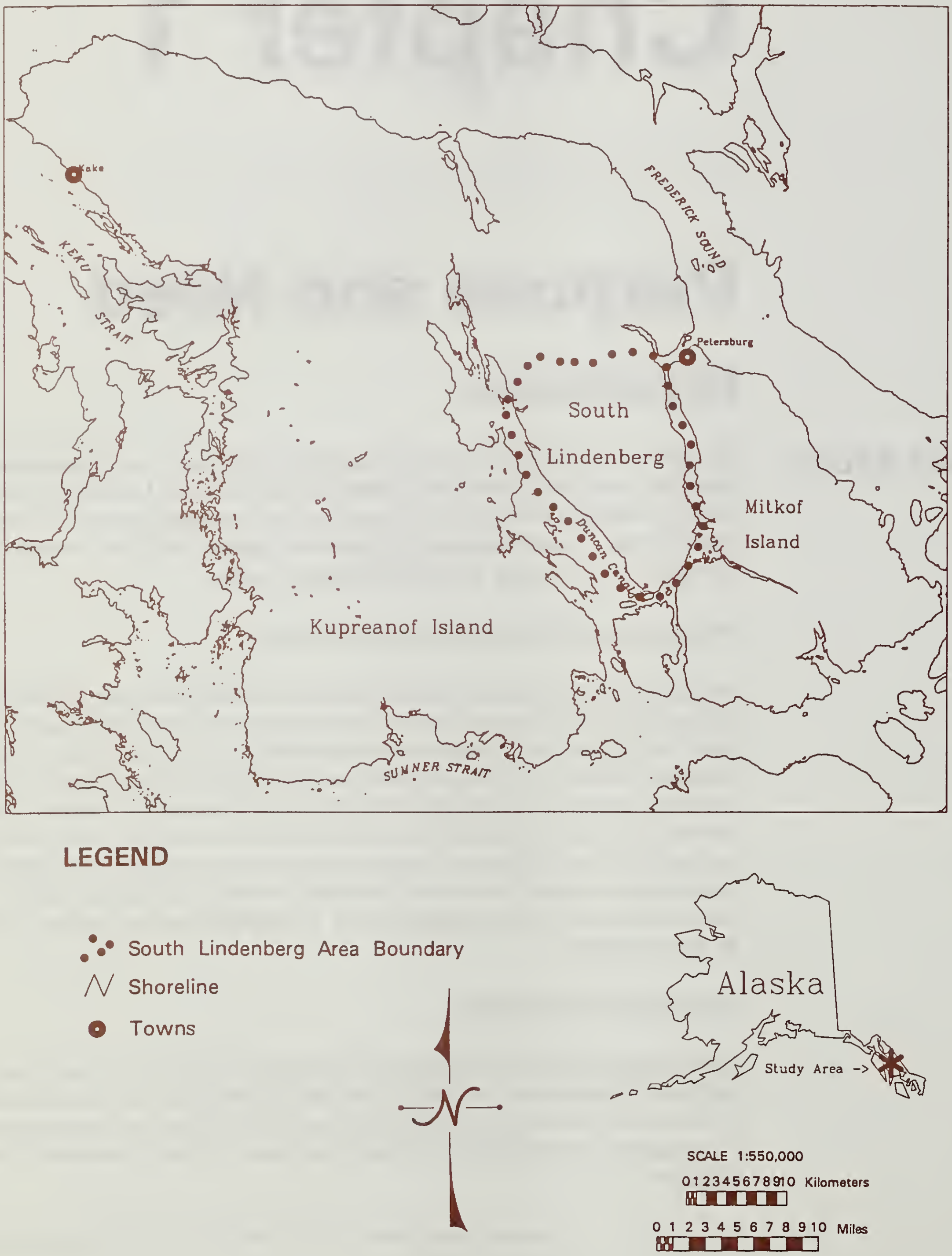
The purpose of the proposed timber harvest(s) is to meet the goals and objectives for the Stikine Area of the Tongass National Forest and to provide for long-term transportation needs for National Forest visitors and administration. The economies of communities in Southeast Alaska are largely dependent on the Tongass National Forest to provide natural resources for uses such as fishing, timber harvesting, recreation, tourism, mining, and subsistence. The Draft Forest Plan Revision and several studies used in this analysis conclude that market demand for timber will remain strong during the 1990s with National Forest timber expected to account for at least two-thirds of the total harvest. The proposed sale or sales would provide approximately 40 MMBF of the government's commitment to the timber industry.

Decisions To Be Made

The management decisions to be made by the Stikine Area Forest Supervisor are whether and how to make timber available in the South Lindenberg study area to meet market demands and Forest Plan Goals for Southeast Alaska. Based on the environmental analysis of consequences in this EIS, the following decisions will be documented in the Record of Decision:

- whether or not timber volume should be made available for harvest, and if so, how much;

Figure 1-1
Location of South Lindenberg Study Area



- the location and design of timber harvest units;
- the location and design of associated mainline and local road corridors; and
- mitigation measures associated with implementation of timber harvest.

Management Direction

The 1979 Forest Plan as amended is presently undergoing revision. Although not yet approved, management procedures and guidelines within the revision are being used when they are more restrictive than those in the current forest plan. For example, the revision (Draft Forest Plan Revision) subdivides the four previous land use designations into 23 LUDs. By considering both land management plans, the analysis within this EIS and any resulting decisions will ultimately be consistent with both the present guidelines and future land management direction.

Most of the South Lindenberg area, as well as most of Kupreanof Island, continues to be designated by the Draft Forest Plan Revision for intensive development to maintain and promote industrial wood production. However, some lands near Wrangell Narrows and other waterways are now designated as scenic viewshed or modified landscape areas where visual resource protection is increased (Figure 1-2). Timber harvest in these areas must be designed to protect near distance views. Outside the analysis area, timber harvest is prohibited in the adjacent Petersburg Creek-Duncan Salt Chuck Wilderness (MA S15).

The South Lindenberg area includes Value Comparison Units (VCUs) 437, 439, and portions of VCUs 447 and 448. The 1985-86 Amendments to the Forest Plan do not identify any logging for VCUs 437 and 439. The Forest Plan does suggest 15-25 MMBF to be harvested from VCUs 447 and 448. VCUs 437 and 439 are currently classified as LUD IV and VCUs 447 and 448 are classified as LUD III. The Draft Forest Plan Revision does not propose specific harvest goals for these VCUs.

This EIS is tiered to the Tongass Land Management Plan and the Alaska Regional Guide (1983). Tiering means that the EIS follows guidance provided in those planning documents. Relevant portions of those documents are incorporated by reference into this EIS.

Organization of this EIS

Chapter 1 provides the purpose and need for which the Forest Service is proposing action, the public issues surrounding the action, and other introductory information. Chapter 2, Alternatives, presents and compares the alternatives and includes summary information on their environmental impacts, implementation, and mitigation. Chapter 3, Affected Environment, describes the environment which may be affected by the alternatives being considered. Chapter 4, Environmental Consequences, predicts environmental changes likely to occur with implementation of the alternatives. These changes include both direct and indirect impacts of the alternatives for each resource issue. Potential cumulative impacts of reasonably foreseeable or similar actions are also disclosed. Finally, supportive information is included in the appendix of the EIS.

Location

The proposed South Lindenberg timber sale is located on the southern half of Lindenberg Peninsula, on Kupreanof Island, immediately west of Petersburg, Alaska. The project area is in the southeastern portion of Kupreanof Island between Duncan Canal and Wrangell Narrows (Figure 1-1). The area encompasses approximately 65,000 acres within Townships 58, 59, 60, and 61 South, and Ranges 77, 78, and 79 East, Copper River Meridian. Tongass National Forest manages approximately 58,000 acres of the area. Elevations range from sea level to 3,300 ft. The area is partially roaded as a result of previous timber sales. The Tonka Log Transfer Facility (LTF) provides vehicle access to the Lindenberg logging road system, and is located on Wrangell Narrows approximately six miles south of Petersburg. Although outlying coastal areas can be reached by float plane or boat, many parts of the interior are accessible only by helicopter or on foot.

The analysis area comprises all of VCUs 437, 439, and portions of VCUs 447 and 448 (Figure 1-2). VCUs are distinct geographic areas, each of which generally encompasses a drainage basin containing one or more large stream systems. Adjacent VCUs having common management direction constitute Management Areas (MAs). VCUs 437 and 439 are part of MA S13, whereas VCUs 447 and 448 are included in MA S16. The most concise descriptions of management direction and scheduled activities for these MAs can be found in the 1985-86 Amendments to the Forest Plan. More current information and direction is provided in the Draft Forest Plan Revision.

The management prescriptions included within the South Lindenberg areas differ as to the specific mix of resource values emphasized. Management direction for Scenic Viewshed is to "maintain scenic quality in areas viewed from popular land and marine travel routes and recreation areas, while permitting timber harvest"; direction for Modified Landscape is to "provide for natural-appearing landscapes while allowing timber harvest"; and direction for Timber Production is to "manage the area for industrial wood production (and) promote conditions favorable for the timber resource and for maximum long-term timber production."

Background

The proposed project is a component of the overall timber sale program on the Tongass National Forest. Timber sales are allowed by the Forest Plan in order to maintain a supply of timber from National Forest lands for Southeast Alaska. The timber would be sold in one or more timber sales.

The purpose of this project is to implement the Tongass Land Management Plan (TLMP or Forest Plan), by making approximately 40 million board feet (MMBF) of timber available for harvest as part of the Stikine area timber sale program. The need for this project is to supply timber volume from the Tongass National Forest to industry in an environmentally sensitive manner consistent with current Forest Plan land use designations. The transportation development associated with the harvest of this timber will provide the long-term transportation needs for National Forest administration, motorized recreation, firewood gathering, and access to the area by local residents.

Section 101 of the Tongass Timber Reform Act (TTRA) directs the Forest Service, "to the extent consistent with providing for multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber and (2) meets the market demand from such forest for each planning cycle." Section 101 specifies that Forest Service efforts to seek to meet market demand are subject to appropriations, National Forest Management Act (NFMA) requirements, and other applicable laws. Providing a timber supply from the Tongass for sustained local wood products industry employment, and related economic and social benefits, is an objective of the Forest Plan and the Alaska National Interest Lands Conservation Act (ANILCA), as amended by TTRA.

This project is one part of a timber management program designed to implement the Forest Plan and meet TTRA direction. Recent timber market assessments (Morse, 1995) confirm that there is underutilized mill capacity in the region and a strong market for wood products. Under current market conditions, there is good potential for timber sales from the project area to be profitable to operators. Under these circumstances, and given the limited supply of timber from other sources, there is a market demand for timber from the project area and all sales offered are expected to be purchased.

Because most of Kupreanof Island has been and is proposed to be managed for timber production, several timber harvests have occurred or are being planned. Past sales were originally offered as independent timber harvests. Some never sold; two were incorporated

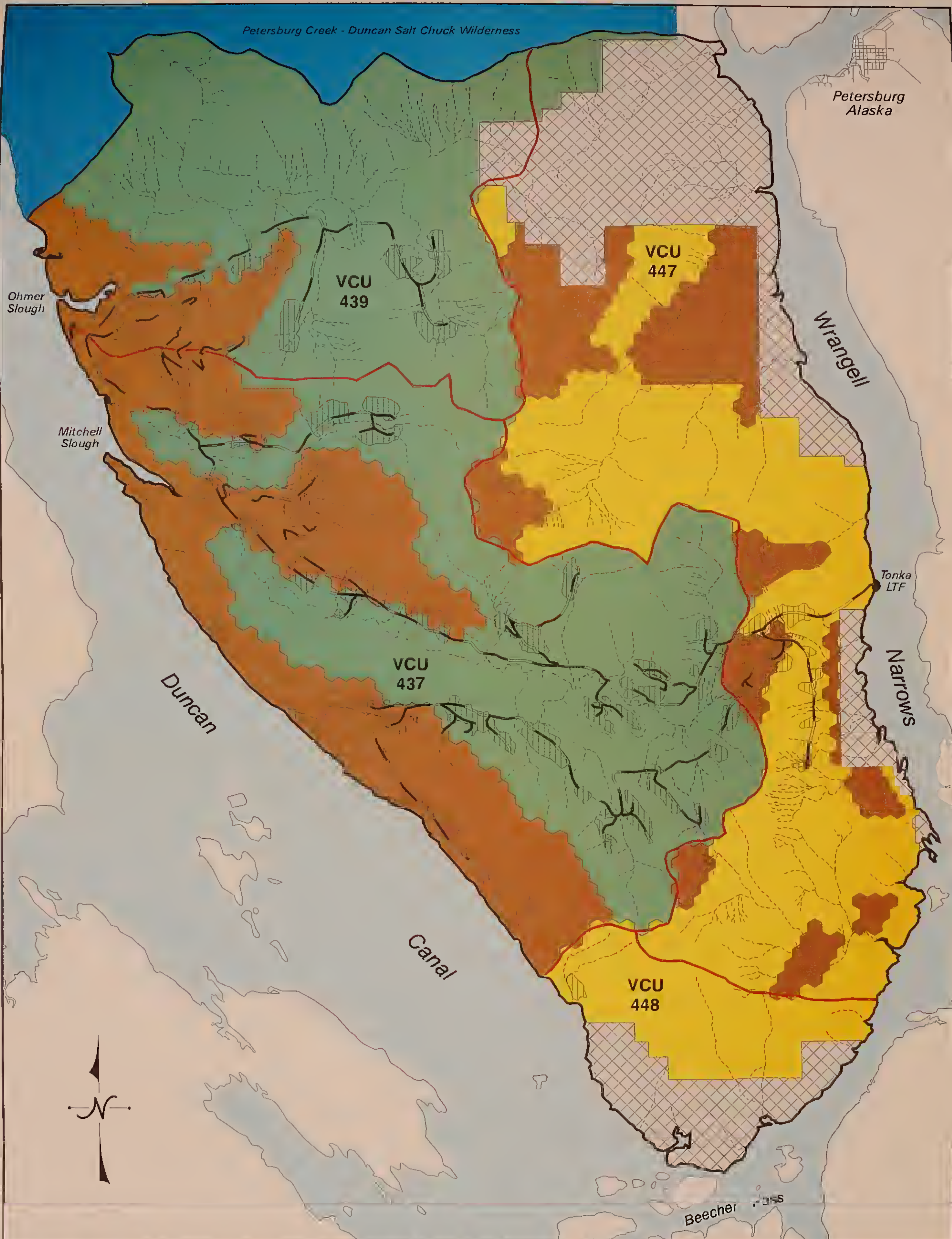


Figure 1-2. South Lindenberg Area with VCU Boundaries, Management Prescriptions (MPs), and LUD Designations

LEGEND

- Study Area Boundary
- VCU Boundaries
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest

Updated TLMP Revision, Alternative P MPs
(LUDs from 1985-86 TLMP Amendments)

- WW - Wilderness (LUD I)
- SV - Scenic Viewshed (LUD II)
- ML - Modified Landscape (LUDs III & IV)
- TM - Timber Production (LUD IV)

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

as substitute volume for long-term contracts. Timber harvests for which harvest is complete include:

- Hamilton Creek South, completed in 1981,
- Portage Twelve-Mile, completed in 1984,
- Todahl, completed in 1990,
- Toncan, completed in 1992,
- Missionary, completed in 1992,
- Tonka Mountain, completed in 1992.
- White Alice Salvage, completed in 1993.
- Bohemia, partly incorporated into Combination Timber Harvest;
- Pipeline, wholly incorporated into Combination Timber Harvest; and
- Combination, completed in 1993.

Timber harvests which have been sold but harvest has not been completed include:

- North Irish Creek, sold in 1980, sale terminated in 1992, remaining volume partially incorporated into Shamrock Timber Harvest; and

- Bohemia Mountain, ROD issued in the fall of 1995, currently being implemented.

Other pending timber harvests include:

- Shamrock Timber Harvest, issued in the spring of 1996, scheduled for sale September 1996.

- Alternatives - to - Clearcutting, scheduled for 1997.

Analysis Process

The Tongass National Forest first published a Notice of Intent to prepare the South Lindenberg EIS in the Federal Register on 19 July 1993 (Vol. 58, No. 136, pp. 38557-38558). The required services were contracted in October 1993, and an interdisciplinary team (IDT) of resource specialists was formed to conduct the analysis and prepare the EIS. Following field studies of existing resource conditions, a second Notice of Intent reduced target volume for South Lindenberg from 55 to 40 MMBF in 27 January 1995 (Federal Register (Vol. 60, No.18, pp. 5347).

Preliminary issue identification began in November 1993 through agency responses to the Federal Register notice, a review of issues raised in other recent timber harvests, and management concerns raised by resource specialists. A public participation plan was also prepared. Public scoping of issues formally began in February 1994 with the mailing of a scoping notice and scoping statement to more than 120 public participants on a mailing list maintained by the Forest Service. Scoping announcements were simultaneously posted in a variety of public places in the vicinity and published by area news media. Responses from the public were then used to identify additional issues and refine those already under consideration. Additional opportunities for public input on issues and concerns included mailings and public open houses during spring and summer 1994.

Field studies were conducted to collect specific information relative to issues and to verify resource information contained in the Tongass National Forest geographic information system (GIS). Examples of resource values displayed by GIS include sensitive stream zones, important wildlife habitat, timber and soil inventories, and location of proposed harvest units. Field studies utilized unit and road design cards for all action alternatives to document the location of proposed harvest units and roads. Resource specialists listed specific

concerns on the cards, and also recommended how those concerns should be addressed or mitigated (Appendix A).

Information from field studies and GIS were then used to address the issues and analyze the environmental effects of each alternative. The entire analysis was used by the Forest Service to select a preferred alternative for publication in both the Draft and Final EIS. This Draft EIS is being distributed for public review and comment. The Forest Service will then respond to all comments and integrate changes into the Final EIS.

Inventories, resource specialist reports, and GIS information are part of the South Lindenberg planning record. Also included in the planning record are results of public scoping and the unit and road design cards. The planning record is available for public inspection at the Petersburg Ranger District in Petersburg, Alaska, following publication of the Final EIS.

Significant Issues

Issues represent discussion, debate, or dispute regarding environmental effects. They are developed from comments from within and outside the Forest Service. In order to provide a concise analysis, the agency distinguishes between significant and nonsignificant issues. Significant issues are used in the analysis for formulating alternatives, developing mitigation, and tracking effects. Nonsignificant issues are considered only minimally or not considered in the analysis. Chapter 4 also has a section called "Other Environmental Considerations." This section includes documentation for findings required by law, even though they are not significant issues in this analysis.

Issues Related to Timber Production

Timber Management

Comments - A major concern is the long-term health and productivity of the forest. From a timber resource perspective, the conversion of old-growth stands to second-growth stands that are more productive for wood fiber is a positive benefit of harvesting. However, loss of forest productivity occurs if mass-wasting results from harvesting activity.

A number of comments addressed the planned harvest level for the South Lindenberg Sale, questioning if the original target volume of 55 MBF was a sustainable rate of timber harvest. Alaska Department of Fish & Game (ADF&G) commented that if 55 MMBF are harvested from the proposed project area, then more than two-thirds of the total estimated operable timber for the South Lindenberg Peninsula will have been cut only 20 years into the planned 100-150 year rotation period. Narrows Conservation Coalition (NCC) requested that a full range of timber harvest volumes be represented by different EIS alternatives. Several comments expressed concern that the proposed timber harvest volume was chosen by the Forest Service prior to in-depth analysis of appropriate timber production goals. Numerous comments addressed the need to assess cumulative effects from the proposed action, given the other ongoing and proposed timber sales on Kupreanof Island. Subsequent resource analyses resulted in the reduced target volume of approximately 40 MMBF for this impact assessment.

Issue - How will long-term forest health and productivity be affected by harvesting and the specific harvest treatments proposed for the South Lindenberg area?

Measurement - The effects of harvest treatments were assessed at the unit level. Each unit in the unit pool was evaluated for the appropriate silvicultural treatment and for potential effects of mass-wasting. Based on this evaluation, the silvicultural prescription, logging method, and unit boundaries for each unit were selected.

Also read the section on Timber in Chapter 3 (pp. 3-14 to 3-22) on the existing resource conditions and Chapter 4 (pp. 4-10 to 4-24) on the environmental consequences of the proposed action.

Harvest Economics

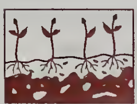
Comments - Ketchikan Pulp Company (KPC), Narrows Conservation Coalition (NCC), Alaska Department of Fish & Game, (ADF&G), and private individuals provided comments concerning potential economic impacts of the South Lindenberg timber harvest. KPC commented on the importance of considering economics as a factor in determining the unit pool and the locations of access roads in order to avoid below cost sales. NCC requested that an overall analysis of the potential economic impacts of the proposed project on the surrounding areas be conducted. They expressed concern about the cost effectiveness of the project and requested that cost recovery be elevated to a significant issue for the DEIS and that the DEIS show a current value appraisal and a complete TSPIRS analysis after payments to the State of Alaska. NCC also expressed concern about the cost of repairing damaged roads and culverts and stabilizing slopes in areas where timber was harvested from steep slopes. ADF&G stated that the DEIS should contain an economic analysis of the potential impacts of the proposed project specifically on the fishing, hunting, and tourism industries. One individual was concerned about the cost of road building on the southern end of the project area due to the large number of wetlands present. Another individual expressed concern over timber harvest sales regularly operating at a loss and the inevitable cost to the taxpayer.

Issue - Will action alternatives within the South Lindenberg area include timber harvests that are profitable and meet economic criteria for independent timber harvests in Tongass National Forest?

Measurement - Responsiveness to this issue was shown by determining how well the sale(s) is predicted to meet the mid-market test for profitability to business and industry, and by evaluating the expected investment returns to the government.

Also read the section on Economics in Chapter 3 (pp. 3-107 to 3-108) on the existing resource co conditions and Chapter 4 (pp. 4-126 to 4-130)on the environmental consequences of the proposed action.

Issues Related to Fisheries



Soils

Comments - Increased soil erosion and sedimentation in water bodies are potential adverse effects to fisheries of harvesting and road building in forested areas. ADF&G and NCC asked that all areas with slopes exceeding 75 percent be deleted from the timber base. NCC asked that slope and the soil stability classification for each unit be listed in the FEIS. ADF&G recommended reviewing the causes of existing slides and slumps that resulted from previous timber harvest activities to avoid future occurrences. One individual expressed concern over the potential for microbes and fungi to be lost from the soil in clearcut areas.

Issue - To what degree will soil erosion and sedimentation increase as a result of harvest activities and the construction of roads in the South Lindenberg area?

Measurement - Each unit and road segment was evaluated for soil hazards. This evaluation was the basis for selection of appropriate logging methods and for determining unit boundaries and road locations to minimize the risk of increased erosion and sedimentation.

Also read the section on Soils in Chapter 3 (pp. 3-7 to 3-8) on the existing resource conditions and Chapter 4 (pp. 4-1 to 4-5) on the environmental consequences of the proposed action.

Watersheds

Comments - Alaska Department of Environmental Conservation (ADEC), ADF&G, and NCC provided comments regarding watersheds. NCC requested that existing information be considered regarding long-term reduction in stream flows caused by increased rates of evapotranspiration in clearcut areas. ADF&G, ADEC, and NCC expressed concerns about water quality impacts and fish habitat degradation from harvesting on steep slopes. ADF&G noted that there has already been a significant timber harvest in the vicinity of the South Lindenberg study area, and that it would therefore be a good place for the Forest Service to conduct a watershed analysis before additional harvesting. ADEC was concerned primarily with maintaining water quality standards. They requested that protocols for monitoring water quality and the effectiveness of best management practices be addressed in detail during the EIS process. ADEC advocates reporting thresholds of concern for the level of timber harvests in watersheds and then conducting a cumulative watershed analysis if, or when, the threshold is approached. ADEC requested that proposed measures to mitigate water quality impacts be included in the DEIS. They ask that the EIS demonstrate that the risk of exceeding State Water Quality Standards for various parameters has been minimized. Several local residents expressed concerns over potential impacts to water quality of streams they use as sole water sources.

Issue - To what degree will timber harvesting adversely affect the hydrologic balance and water quality of streams in the South Lindenberg study area?

Measurement - Measures of watershed impacts included harvest area and road miles within each watershed, miles of Class III streams adjacent to or within harvest units, and number of road stream crossings. In addition, each watershed was assessed for its sensitivity to management activities.

Also read the section on Watersheds in Chapter 3 (pp. 3-9 to 3-14) on the existing resource conditions and Chapter 4 (pp. 4-6 to 4-10) on the environmental consequences of the proposed action.

Fisheries

Comments - ADF&G, U.S. Fish and Wildlife Service (USFWS), NCC, and individuals provided comments regarding fisheries resources in the South Lindenberg area. ADF&G expressed concern about the impact of road stream crossings on fisheries resources and listed the general standards by which stream crossings are reviewed: stream crossings and bank alterations are to be minimized, disturbed streambanks are to be immediately stabilized to avoid erosion, structures should be designed to accommodate efficient passage of fish and should not be constructed of materials containing toxic wood preservatives, activities should be timed to avoid sensitive fish life stages, and bridges or open-bottomed structures rather than culverts should be used for road crossings over salmon spawning habitat. NCC was particularly concerned about declining steelhead populations and the potential for timber harvesting to exacerbate the problem. NCC requested that the South Lindenberg EIS discuss the history and methodology of the PACFISH strategy, and use these standards in its analysis. Comments by the USFWS and private individuals included concerns over the potential for increased sediment in fisheries streams, the effects on streams of road building, and loss of salmonid populations. The importance of stream buffer width was raised as an issue. It was noted that a 100-foot buffer is a minimum; recommendations were made for extending the stream buffers from 100 to 300 feet on both sides of streams that support fisheries.

Issue - What effects will timber harvest and road construction have on habitats used by trout and salmon?

Measurement - Quantitative measures used in evaluating potential impacts to fisheries included the number of road crossings, miles of road adjacent to streams, miles of Class I and Class II streams requiring buffers along harvest units, and percentage of each watershed selected for harvest. The condition of existing fisheries habitat within major watersheds was also evaluated.

Also read the section on Fisheries in Chapter 3 (pp. 3-44 to 3-49) on the existing resource conditions and Chapter 4 (pp. 4-54 to 4-63) on the environmental consequences of the proposed action.

Issues Related to Old-Growth Forests

Wildlife

Comments - Comments were submitted by agencies, NCC, a homeowners association, and private citizens. ADF&G requested that an interagency approach be used to select the Habitat Conservation Areas (HCAs). They recommended that wildlife surveys be conducted and specific plans to avoid and minimize adverse effects to wildlife be developed. The agency recommended avoiding timber harvest in mid- and high-volume stands below 800 feet in elevation on southerly aspects to ensure wildlife protection in general. ADF&G stated that the rate of harvest on the South Lindenberg Peninsula is not sustainable and will result in high impacts to old-growth dependent wildlife and requested that at least one alternative be developed at lower harvest levels to maintain viable populations. The agency recommended that a minimum width of 200 feet be maintained for all wildlife corridors. They also recommended the use of habitat capability models to analyze the effects on wildlife of recent timber sales. ADF&G, as well as several private individuals, raised concerns over harvesting in deer habitat on the south end of the peninsula. They stated that increased road mileage in the area would result in increased wolf predation of deer, as wolves appear to travel on logging roads. USFWS commented on wildlife management guidelines and requested that surveys be conducted for the marbled murrelet, northern goshawk, spotted frog, waterfowl, and bald eagle. NCC also requested that wildlife surveys be conducted and timber harvest effects be analyzed for moose, bear, wolves, blue grouse, sandhill crane, neo-tropical migrant birds, small owls, Canada geese, and osprey. NCC and others requested the strategy proposed by the Interagency Viable Populations committee should be explained in the South Lindenberg EIS and used in the EIS analyses. Comments from individuals indicated concern about potential impacts from harvesting and road construction to deer, pine marten, bats, and other species. Several individuals stressed the need to verify and identify deer winter range areas by conducting winter field studies.

Issue - What effects will timber harvest and related activities have on wildlife habitat?

Measurement - Information evaluated includes the percentage of habitat and critical habitat affected, computer-projected population numbers and trends, and size or location of harvest units relative to preferred habitats. Existing models of population trends for Sitka black-tailed deer, pine marten, black bear, river otter, bald eagles, red squirrel, red-breasted sapsucker, hairy woodpecker, brown creeper, and blue grouse were used in this evaluation. Surveys for northern goshawk, marbled murrelet, spotted frog, waterfowl, and bald eagle were conducted in appropriate habitats and proposed harvest units.

Also read the section on Wildlife in Chapter 3 (pp. 3-18 to 3-44) on the existing resource conditions and Chapter 4 (pp. 4-28 to 4-54) on the environmental consequences of the proposed action.

Threatened, Endangered, and Sensitive (TES) Species

Comments - Federally listed TES plants and animals are protected by law from impacts due to harvesting on Forest Service lands. The Forest Service released a revised list of sensitive species for the Tongass National Forest in June 1994. In the scoping process, one individual

commented that the Forest Service should not "waste" taxpayer's money by conducting field surveys, since no TES plants are known to occur in the South Lindenberg area. The USFWS stressed the need for increased site monitoring for Category 2 candidate plant species.

Issue - Will harvesting and road construction result in adverse impacts to any populations or critical habitat of TES plants and animals?

Measurement - Potentially affected TES plants were identified by consultation with the Alaska Natural Heritage Program (ANHP) and USFWS. Proposed harvest units and roaded areas were surveyed for populations of federally listed TES plant species. Surveys for potentially affected TES animals and animal species of concern were conducted as part of the wildlife studies previously described.

Also read the section on TES Species in Chapter 3 (pp. 3-49 to 3-60) on the existing resource conditions and Chapter 4 (pp. 4-63 to 4-81) on the environmental consequences of the proposed action.

Biological Diversity

Comments - Many general comments concerning biological diversity were received from agencies and individuals, the most common concern being loss of old growth forests. ADF&G recommended minimizing forest fragmentation by locating units on the edges of old growth blocks wherever possible. USFWS suggested minimizing forest fragmentation by using selective cutting techniques. If clearcutting is done, they favor smaller clustered units over larger scattered units. ADF&G requested that current conservation biology concepts and strategies for maintaining biodiversity be incorporated in the DEIS. As a source of this information, both ADF&G and NCC recommended relying on the draft Interagency Viable Populations Committee report. ADF&G requested that a forest fragmentation analysis be included in the DEIS. Comments from individuals addressed concerns about maintaining biodiversity, loss of old growth, and the cumulative effects of all timber harvests on Kupreanof Island. One individual stated that biodiversity and the effects of habitat fragmentation should be studied on a larger scale than the confines of the project area.

Issue - How will timber harvesting associated with the South Lindenberg Sale affect the biodiversity and old growth structure of Kupreanof Island?

Measurement - Biodiversity is a combination of various natural resource attributes including old growth, wildlife, fisheries, critical natural areas, and threatened and endangered species. The measurement of potential impacts to biodiversity involved quantifying changes in the amount of old growth and forest fragmentation, and evaluating effects on wildlife habitat, fisheries, and threatened and endangered species.

Also read the section on Biological Diversity in Chapter 3 (pp. 3-60 to 3-75) on the existing resource conditions and Chapter 4 (pp. 4-81 to 4-93) on the environmental consequences of the proposed action.

Issues Related to Society

Subsistence

Comments - NCC, ADF&G, a Kupreanof city official, and private individuals provided comment on the potential impacts of the proposed project on subsistence use of the South Lindenberg Peninsula. ADF&G stated that subsistence considerations should influence the selection of alternatives and the final decision. They commented that the Forest Service should focus the subsistence impacts analysis on a wider area than the project area. NCC argued that an alternative should be developed specifically to address subsistence use. The effects of increased access on subsistence was a concern that elicited a number of comments. While an expanded road system may provide greater access for subsistence hunters, the

ultimate effect may be detrimental to long-term subsistence use if populations are over-harvested as a result of greater access. In addition, it was noted that road access is impractical for subsistence hunters from the Petersburg area. Individuals living within the project area were particularly concerned over the potential timber harvest impacts to adjacent hunting areas.

Issue - To what extent will each alternative affect subsistence resources and use within the study area? (Section 810 of the Alaska National Interest Lands Conservation Act [ANILCA] requires the agency to document a finding on whether, or not there is a significant possibility of a significant impact on subsistence resources and use.)

Measurement - The following measures of impacts were assessed: computer model predictions of the change in abundance and distribution of subsistence resources, change in access to subsistence resources, and changes in competition from non-subsistence users for subsistence resources.

Also read the section on Subsistence in Chapter 3 (pp. 3-75 to 3-82) on the existing resource conditions and Chapter 4 (pp. 4-93 to 4-103) on the environmental consequences of the proposed action.

Recreation

Comments - Several individuals stated or implied that considerations of recreation on and around the South Lindenberg Peninsula have been underestimated. Tourism has increased recently bringing an influx of people seeking recreational opportunities. Sport fishing, hunting, skiing, hiking, camping, boating, and wildlife viewing were mentioned as the primary recreational activities in the area. Most comments expressed concern over the impacts of the proposed project on tourism and the recreational opportunities of local residents. While one local resident stated that more roads would increase recreational access, NCC and other residents commented that there is already ample opportunity for roaded recreation without creating additional roads. They argued that recreation does not necessarily increase with an expanding road system. Several individuals commented that roadless areas are more valuable than roaded areas for recreation; roads destroy the isolation and wilderness setting that is sought by many who recreate in Alaska. NCC listed a number of heavily used recreation areas and proposed that no timber harvest occur in these areas. NCC also expressed concern that funds would not be available to maintain the roads in safe condition for roaded recreation. They also requested that an analysis of the potential effects of the project on wildlife viewing opportunities be included in the DEIS. One individual stated that the five year recreation plan for the area has not been followed, and it should be implemented before the Forest Service is allowed to proceed with new plans that include timber harvest. ADF&G was concerned that timber harvesting will result in a loss of deer habitat and thus fewer deer will be available to sport hunters.

Issue - What effect will the proposed sale or sales in this area have on recreational opportunities?

Measurement - This issue was evaluated by identifying changes in recreational opportunity, as identified in the Recreation Opportunity Spectrum, and by changes in access to and the nature of the experience at sites identified on the Forest Service inventory of recreation places.

Also read the section on Recreation in Chapter 3 (pp. 3-82 to 3-88) on the existing resource conditions and Chapter 4 (pp. 4-103 to 4-107) on the environmental consequences of the proposed action.

Visual Resources

Comments - Numerous comments were made addressing the potential impacts of timber harvesting on the visual quality of the area, particularly as seen from Wrangell Narrows. Concerns primarily related to effects on the tour boat industry and on the viewsheds of residents on Mitkof and Kupreanof Islands. NCC suggested that one EIS alternative focus entirely on impacts to Recreation, Visuals, and Subsistence. They provided a list of sensitive viewpoints and recommended that no clearcuts be allowed in the sensitive viewsheds. Individuals specifically mentioned scenic considerations along Wrangell Narrows, Keene Channel, Beecher's Pass, Duncan Canal, and Skogs Creek valley. Concern was expressed by several residents that the Toncan timber sale did not meet Visual Quality Objectives (VQOs). One commented that more clearcutting should not occur in this viewshed until the area has had a chance to recover its visual character. The Alaska Department of Parks and Outdoor Recreation expressed concern about impacts to views from the Beecher Pass State Marine Park.

Issue - To what extent will each alternative influence the landscape character of the South Lindenberg area, and to what extent will harvest designs be mitigated to protect visual quality?

Measurement - Visual quality was quantitatively evaluated by VQOs using standardized procedures developed by the Forest Service. Visibility and visual ability of an area to absorb management activities were considered. Potential impacts to visual resources were measured from sensitive travel routes and commonly used areas.

Also read the section on Visual Resources in Chapter 3 (pp. 3-88 to 3-104) on the existing resource conditions and Chapter 4 (pp. 4-107 to 4-125) on the environmental consequences of the proposed action.

Issues Considered Not Significant

Air Quality

Comments - No specific comments were received, but concerns about visual resources include certain aspects of air quality. The Forest Service is required by law to document a finding regarding the effect of the alternatives on air quality.

Concern - Are there potential air quality impacts due to burning, road construction, or harvest activities?

Measurement - Although extensive burning is not currently planned for the South Lindenberg area, an analysis of particulate emissions on unpaved roads was conducted.

Also read the discussion of the existing resource conditions for Air Quality in the Climate section of Chapter 3 (pp. 3-1 to 3-3). Since impacts to air quality were found to be negligible, air quality is not discussed in Chapter 4.

Cultural Resources

Comments - One individual noted the historical value of the Skogs Creek area with regards to past gold mining activities. NCC specified Duck Creek, A-Frame Creek, and Skogs Creek as potential areas of study for possible historical sites.

Concern - To what extent would cultural resources, particularly Native American sites, be impacted by harvesting in the South Lindenberg area?

Measurement - Literature reviews and field inventories in areas likely to have been previously inhabited or utilized were used to identify areas of cultural sensitivity. No culturally significant resource sites were identified in areas proposed for harvest and road building. Mitigation measures will be developed if cultural resources are encountered during site disturbance associated with timber harvest.

Also read the section on the Cultural Resources in Chapter 3 (pp. 3-105 to 3-107) on the existing resource conditions and in Chapter 4 (pp. 4-125 to 4-126) on the environmental consequences of the proposed action.

Floodplains

Comments - In addition to their importance for conveyance of floodwater, floodplains by their very nature are prone to disturbance. Consequently, permanent facilities constructed in floodplains must be able to withstand design floods without suffering significant damage. No comments were received regarding floodplains during the scoping process.

Concern - Will harvest activities and road construction in the South Lindenberg area affect the conveyance of floodwater or result in an increase in potential flood damage?

Measurement - The amount of harvest area in floodplains was quantified. Hydrologic studies were used to assess the potential increase in floodflows due to harvesting in each watershed.

Since the proposed action does not include construction of any facilities in floodplains, impacts to facilities within floodplains are not an issue. See section on Watersheds in Chapter 3 (pp. 3-9 to 3-14) for discussion of existing streamflow conditions and in Chapter 4 (pp. 4-6 to 4-10) for impacts to streamflow.

Lands

Comments - There are a number of privately owned lands located within the proposed project area. Many of these lands have been developed and contain summer homes, year-round homes, and guest lodges. Concern was expressed by one individual over the potential impacts from timber harvesting and road building on the investments of the owners in their properties. NCC commented that there may be increased development in the area when the Mental Health Lands issue is settled and titles to some of the properties within the project area are cleared. Therefore, they commented that the potential for increased use of the area by residents should be factored into impacts analyses. NCC expressed concern over road right-of-ways passing through state or private lands as they feel this substantially increases the chances these lands will be logged. They request that all non-federal lands in the study area be identified. In addition, they expressed concern about the potential effects of roading and logging on opportunities to develop water usage, including small hydro projects.

Concern - How will timber harvesting and road building affect land owners and lease holders within the South Lindenberg area?

Measurement - Lands owned, leased, and/or operated by agencies, groups, and private citizens that are either within or adjacent to the project area were identified as non-National Forest lands on the GIS maps used in evaluating effects from development of the action alternatives.

Existing conditions of and environmental impacts to non-National Forest lands were included in Chapters 3 and 4, respectively, when considered appropriate for a specific issue.

Minerals and Geology

Comments - Several individuals commented on the potential for karst formations in the study area and proposed that no logging or roading be allowed in or near karst areas. No concerns regarding mining interests were raised during the scoping process or by resource specialists.

Concern - Will timber harvest and road building in the South Lindenberg area affect mining activities or unique geologic aspects?

Measurement - The presence and location of unique geologic conditions and active mining claims in the South Lindenberg area were reviewed. To the extent possible, the presence of mineral occurrences in the South Lindenberg area that have high value or high development potential were identified. The impacts due to harvesting and road construction to any such claims or mineral occurrences were also evaluated.

Also read the section on Geology in Chapter 3 (pp. 3-3 to 3-7) on the existing resource conditions and the section on Minerals in Chapter 4 (pp. 4-5 to 4-6) on the environmental consequences of the proposed action.

Wetlands

Comments - Federal policy requires that harvest and road impacts to wetlands be minimized. The Army Corps of Engineers expressed concerns over potential wetland impacts from the discharge of dredged or fill material and commented on impact mitigation requirements. USFWS commented on the need to thoroughly delineate all wetlands and analyze potential impacts from the proposed timber harvest.

Concern - What are the expected losses of wetland area and functional value under each harvest alternative?

Measurement - Wetland areas potentially affected by timber harvest and road building were quantified using the GIS database and confirmed by limited ground truthing. Functional analyses of these wetlands were conducted and potential impacts determined for each alternative.

Also read the discussion on Wetlands in Chapter 3 (pp. 3-22 to 3-28) on the existing resource conditions and Chapter 4 (pp. 4-24 to 4-27) on the environmental consequences of the proposed action.

Wild and Scenic Rivers

Comments - NCC commented on rivers being considered for the Wild and Scenic status. They proposed that the harvest be managed so that clearcuts are not visible from drainages outside the project area that may potentially become designated as Wild and Scenic rivers. They identified the Kah Sheets and Castle rivers as candidates for the Wild and Scenic status and expressed concern that views from these drainages would become degraded by clearcuts in the South Lindenberg sale before final designations are decided for these rivers.

Concern - What effects will each alternative have on streams eligible or suitable for "Wild and Scenic River" designation?

Measurement - The indicator evaluated for this issue was change in the outstandingly remarkable values that make each stream eligible for Wild and Scenic River status.

Also read the discussion on Wild and Scenic Rivers in the Recreation section of Chapter 3 (pp. 3-82 to 3-87), existing resource conditions, and Chapter 4 (pp. 4-103 to 4-107), environmental consequences of the proposed action.

Issues Not Addressed in the EIS

Some issues raised by the public are not project specific or else are the subject of pending decisions at a higher level of planning. Examples of issues or comments beyond the scope of this document follow:

1. An analysis of the impacts of management methods on the Tonka Timber Sale was requested.

   The Tonka Timber Sale is a separate project. While the Forest Service used knowledge gained from that sale to inform the EIS process for South Lindenberg, an analysis of the Tonka Sale is outside of the scope of the South Lindenberg EIS.

2. An economic analysis of the potential impacts of the South Lindenberg Timber Sale on the local fishing, tourism, and hunting industries was requested.

   An economic analysis of this type would require analyses and modeling of conditions within Petersburg, Kupreanof, and Wrangell. This scale of study is outside of the scope of the South Lindenberg EIS. A mid-market analysis of the costs and economic benefits of the sale to the U.S. Government is a part of the EIS, however.

3. Site specific monitoring should include population estimates of fish or wildlife.

   The Forest Service has developed computer models to estimate habitat capability and predict effects of habitat loss on populations. The models are based on field work and population figures from the ADF&G and other agencies. The models are periodically revised based on new information.

4. Timber should be harvested in volume classes proportional to occurrence.

   The Tongass Timber Reform Act of 1990 mandates proportional harvest for various timber volume classes on the long term timber harvest contracts. Since this sale(s) is planned to be a part of the independent sale program, proportional harvest was not required for this analysis.

5. Impacts of the proposed road system should be assessed.

   Although many comments were related to roads, culverts, and bridges, transportation itself was not considered an issue or concern. Instead related concerns were discussed in terms of effects on specific resources such as fish, wildlife, and recreation.

6. Impacts of timber sale implementation, particularly operation of the Tonka LTF, should be assessed for water quality and marine biota in salt waters surrounding the South Lindenberg peninsula.

   The Forest Service monitors bark accumulation and distribution as a condition of existing permits for Tonka LTF. Spill prevention plans and specific permits to protect water quality will be required of any contractors

operating the LTF. Harvest related changes in water temperatures and sediments in streams discharging to salt waters are discussed under watersheds and fisheries.

Approvals Required From Other Agencies

The Forest Service has acquired permits from the U.S. Army Corps of Engineers (USACE) and the Alaska Department of Environmental Conservation (ADEC). The following permits are on file at the Stikine Area Supervisor's Office:

U.S. Army Corps of Engineers

A single permit from the USACE incorporates requirements for the Clean Water Act and the Rivers and Harbors Act. It also includes USEPA permits for pollution discharge elimination and spill prevention control and countermeasure. In addition, the USACE permit covers the ADEC Certificate of Reasonable Assurance for compliance with Alaska water quality standards. This permit was issued for the Tonka LTF.

State of Alaska Division of Governmental Coordination (ADGC)

A review coordinated by ADGC determines if the State agencies agree with the Forest Service determination of consistency with the Alaska Coastal Zone Management Plan.

A finding of consistency has been obtained for the Tonka LTF that will be used for the sale(s) planned in the South Lindenberg area. In addition, a State tidelands easement for the use of State tidelands has also been obtained.

U.S. Fish and Wildlife Service

The USFWS must review and approve all Biological Assessments. These are documents that assess the current status of wildlife species of concern on both global and local levels.

Chapter 2

Alternatives

Chapter 2

Alternatives

This chapter summarizes the development of alternatives for making timber available from the South Lindenberg area to the timber sale program of the Petersburg Ranger District, Stikine Area of the Tongass National Forest. The action alternatives selected for this timber sale as well as the no action alternative, are discussed, compared, and evaluated. After this comparison, identification of the Forest Service preferred alternative (Alternative 5) is presented. Specifically, this chapter presents the following information:

- alternative formulation process,
- alternative development for the South Lindenberg area,
- alternatives considered but eliminated from detailed study,
- common features and design elements of the action alternatives,
- detailed descriptions of alternatives,
- a summary comparison of alternatives presented in table format, and
- planned mitigation and monitoring measures.

Alternative Formulation Process

When planning a timber sale, a group of resource specialists known as the interdisciplinary team (ID Team) meets and discusses how best to accomplish the goal described in the "Purpose and Need"section of Chapter 1. The ID Team designs alternatives around themes that provide different approaches to the project purpose and need and that address the major issues raised in the scoping process. For example, where one alternative could emphasize project efficiency, another alternative could emphasize maintaining visual quality of an area. The National Environmental Policy Act (NEPA) regulations (40 CFR 1502) mandate consideration of all reasonable alternatives for a proposed action, including identification and discussion of alternatives eliminated from detailed study.

When developing alternatives, the ID Team utilizes comments and concerns expressed by the public during the scoping process. These comments are consolidated into major issues, and the ID Team then develops strategies that could be used to resolve these issues, and yet respond to the purpose and need of the proposed action. The ID Team also identifies indicators to measure or compare how each alternative responds to the issue for which it was developed.

A primary source of information for selecting areas to harvest timber, build roads and respond to specific environmental elements is a computer-based resource map inventory. Maps are produced that display areas of commercial timber, hazardous soils, Class I and II streams, and other resource characteristics. From these maps, units and roads are designed that best respond to the theme developed for each alternative. The information obtained from the maps is confirmed in the field, and maps are corrected when appropriate. Additional factors observed in the field, but not available in map format, are incorporated into selection and design of units and roads for alternatives.

Each alternative presented in this EIS is a different response to the issues of concern discussed in Chapter 1. For this EIS, four action alternatives were designed to explore ways to address and resolve issues of public concern. Each alternative represents a site-specific mix of proposals that respond to these issues. From this range, the Forest Supervisor has a basis for judging the tradeoffs between implementing each alternative including the no-action alternative. A discussion of this development follows in the next section.

Alternative Development for the South Lindenberg Timber Sale

Planning for the South Lindenberg Timber Sale began when the Tongass National Forest first published a Notice of Intent to prepare the South Lindenberg EIS in the Federal Register on 19 July 1993 (Vol. 53, No. 136, pp. 38557-38558). The required services were contracted in October 1993, and an ID Team of resource specialists was formed to conduct the analysis and prepare the EIS. Following field studies of existing resource conditions, a second Notice of Intent reduced target volume for South Lindenberg from 55 to approximately 40 MMBF in January 1995 (Federal Register (Vol.60 No.18, pp.5347-5348).

Public scoping began with the Notice of Intent and continued through October, 1994. Preliminary issue identification began in November 1993 through agency responses to the Federal Register notice, a review of issues raised in other recent timber harvests, and management concerns raised by resource specialists. A public participation plan was also prepared. Public scoping of issues formally began in February 1994 with the mailing of a scoping notice and scoping statement to more than 120 public participants on a mailing list maintained by the Forest Service. Scoping announcements were simultaneously posted in a variety of public places in the vicinity and published by area news media. Responses from the public were then used to identify additional issues and refine those already under consideration. Additional opportunities for public input on issues and concerns included mailings and public open houses during spring and summer 1994.

In July, public comments were consolidated into specific issues through the preparation of a Draft Scoping Report (Hyatt, 1994). The issues identified from public scoping are summarized in Chapter 1.

Further refinement of the issues of concern occurred as resource specialists of the ID Team consulted maps, publications and other technical professionals familiar with the South Lindenberg area. Between October 1993 and December 1993, a logging system and transportation analysis (LSTA) was conducted and harvestable commercial forest land

identified. From this analysis a preliminary unit pool was generated by the timber resource and transportation specialists of the ID Team using aerial photographs and information collected during preliminary field reconnaissance.

The Draft Action Alternatives Plan was then developed from the unit pool by the entire team of resource specialists at the first ID Team meeting held 28-29 April 1994. During this meeting, issues of concern were reviewed and grouped into themes. Action alternatives were formed by selecting harvest units and roads from the preliminary unit pool that best accomplished the objective of each theme.

Field surveys were then conducted between May and August 1994 to collect site specific data and confirm the accuracy of information previously reviewed, particularly information contained in the Tongass National Forest geographic information system (GIS). Examples of resource information displayed by GIS include sensitive stream zones, important wildlife habitat, timber and soil inventories, and location of proposed harvest units. Field studies utilized unit and road design cards for all action alternatives to document the location of proposed harvest units and roads. Resource specialists listed specific concerns on the cards, and also recommended how those concerns should be addressed or mitigated (see appendices A and B for resource information on specific units and road segments).

Field crews identified proposed unit boundaries and road locations that would be required to implement each of the proposed action alternatives. Unit boundaries and road locations were extensively modified through interactions between foresters, engineers, soil scientists, wildlife biologists, and fisheries biologists. Several proposed harvest units were dropped or modified, due to unstable soils, goshawk nests, watershed/fisheries, and other concerns.

The project landscape architect was highly involved in the planning and design for the alternatives and close attention to visual resources went into the development of the proposed harvest in the South Lindenberg area. Due to the high visual sensitivity of the study area, 70 percent of the originally proposed units in the unit pool were modified to address visual concerns. Several units were dropped that would have been highly visible from the Wrangell Narrows, Petersburg, and Duncan Canal. For units that remained in the action alternatives, unit boundaries were rounded or undulated to blend into the surrounding landscape. Other design techniques included group selection harvest, feathering unit boundaries, and leaving reserve tree clumps.

Alternatives Considered but Eliminated from Detailed Study

The Interdisciplinary Team (ID Team) considered a range of alternatives as well as alternate themes during the analysis before a reasonable set of alternatives was considered for detailed study. Those alternatives eliminated from detailed study included the following:

Harvesting Timber South of Mitchell Creek

The ID Team considered harvest units and roads in the area south of Mitchell Creek and north of Road 6352, but decided not to include any of these units and roads in the unit pool. Reasons for not including this area into any of the action alternatives included:

- Poor economics. The ratio of potential harvestable volume to road miles was less than 1.0.
- Fish and Water Quality Risk. Due to the gentle topography of the area, there was a high likelihood that there would be a high incidence of unmapped Class 2 streams within proposed units, which would further reduce the amount of estimated available volume in this area.

- Fisheries and Water Quality Risk. A bridge across Mitchell Creek was proposed that would have been expensive and potentially result in adverse impact on water quality.

Constructing an Alternative Road Loop From the North

The ID Team considered locating a loop road that would have connected the current terminus of Road 6350 in the Duncan Creek drainage and proposed Road 43520 within the Skogs Creek drainage. This was not included in any of the action alternative for the following reasons:

- This road would have been located across several miles of property located outside the National Forest where no Federal timber would be accessed.

- Locating a road from the south around Mountain Point was cheaper than building a connecting road from Duncan Creek.

Harvest North and East of Proposed Units 57 and 58

The ID Team considered locating several harvest units north and east of units 57 and 58. These units were dropped from consideration because of the presence of an active goshawk nest. Harvesting these units would not have met interim management guidelines for managing the Queen Charlotte Goshawk.

Harvest West of Proposed Unit 16

The ID Team considered locating several harvest units west of Unit 16. These units were dropped from consideration because of the presence of an active goshawk nest located north of Duncan Creek. Harvesting these units would not have met interim management guidelines for managing the Queen Charlotte Goshawk.

Activities Associated with Timber Harvest

There are a number of different activities associated with harvesting timber. Basically timber harvesting is the process by which trees are cut into logs and transported to a manufacturing facility, such as a sawmill or pulp mill. The major activities involved in a National Forest timber sale are summarized below:

Road Construction

This process involves the construction of logging roads needed to harvest the timber. Road construction activities include clearing vegetation, excavating and filling material, applying a road base and road surface. It includes development of rock pits and quarries from which rock is obtained to construct specified roads for long-term use, and temporary roads and landings needed to harvest timber.

Falling and Bucking

This process involves the cutting of trees (falling/felling) and cutting felled trees into logs of desired lengths (bucking). This activity would occur under all action alternative and would not vary by alternative or harvest unit.

Yarding

This is the process of moving logs from the stump to a landing or other point of transportation. The type of yarding would vary by harvest unit. Yarding logs is accomplished using ground-based equipment, cable logging systems, or helicopters. The method used is dependent on such factors as cost, topography, slope, resource protection needs, and access. Each action alternative would utilize varying amounts of each logging system.

Ground based systems include shovel and tractor. Shovel logging is the process of moving logs from the stump to the landing by repeated swinging with a swing-boom loader. The

loader is walked off the haul road and into the harvest unit. Logs are decked progressively closer to the a haul road with each pass of the loader until they are finally decked at roadside. For this system to be used effectively, slopes should be less than 20 percent. Unit 21 and portions of several other units have been identified as appropriate for shovel logging. Tractor yarding has generally been considered unacceptable in Southeast Alaska, but rubber-tired skidders are used under certain circumstances (along roads, frozen ground, etc.).

Cable logging systems include highlead, mobile yarder, and slackline-skyline systems. These systems can be used to yard logs both up and down hill. Logs yarded by highlead systems are generally dragged on the ground with some lift to one end (hence the term "highlead") because of the lift provided by the tower height (generally 60-90 feet). Where downhill highlead yarding is used, the drag corridors radiate away from the landing to the edge of the setting boundary. There is a possibility of more ground disturbance using downhill highlead yarding. Skyline or slackline systems in a skyline configuration are able to lift one end of the log or completely suspend the logs, reducing the amount of ground disturbance. The latter system is effective, but is more expensive. Mobile yarders operating in a skyline configuration can provide log lift and are cheaper and require less landing space than slackline yarders. However, mobile yarders do not have the same lift capabilities due to smaller lines and shorter tower heights and cannot reach as far into the unit.

Helicopter yarding is an aerial method of moving logs from the harvest unit to the landing without disturbing the ground. Total suspension of logs is achieved, resulting in the least amount of soil impact. Helicopter yarding is the most expensive of all yarding systems considered in this project and is considered only when road building costs to access remote areas are too excessive or where resource concerns preclude ground-based yarding. Helicopter yarding is proposed for units that would be harvested by a group selection method. This system offers more flexibility in locating groups or unit boundaries than cable yarding since logs can be lifted directly to the helicopter instead of in a straight line along the ground, as in cable yarding.

Sorting and Loading

This process involves the sorting of logs by grades (either at a landing or a dry sort area) and placing logs on logging trucks. A dry sort area is a central area outside a harvest unit used to sort logs before hauling to a log transfer facility (LTF). One new location for sorting logs was identified by the ID Team.

Log Hauling

This process involves transporting logs from a landing to a log transfer facility (LTF) or sort yard by log trucks.

Dumping and Rafting

This the process of bundling, dumping, and rafting logs into the water at an LTF. The existing Tonka LTF and rafting area would be used by all action alternatives for the hauling and dumping of logs harvested in the South Lindenberg area.

Log Towing

This is the process of towing logs with tugboats from the LTF to the manufacturing facility. Logs are usually assembled into rafts consisting of 50-75 bundles (truck loads), which are then towed to a sawmill or pulp mill. Sometimes logs are loaded into barges for towing.

Design Elements Common To All Action Alternatives

Windfirm Boundaries

All units were designed to minimize windthrow. Boundaries were located around topographical features and vegetative conditions that provided protection from wind. Natural windfirm areas such as muskegs, openings, or rock outcrops were used as boundaries where available.

Stream Buffers

The Tongass Timber Reform Act (TTRA) requires a buffer zone of no less than one hundred feet in width on each side of all Class I streams and on those Class II streams which flow directly into Class I streams. (See USDA Forest Service [1995] for a more detailed description of which Class II streams require TTRA buffers.) This feature is incorporated into all action alternatives where harvest units are adjacent to such streams. The streams and their respective buffers are located outside of harvest units. Measures to protect other streams include directional falling of trees away from streams, partial log suspension, split-yarding, and removal of logging debris from stream courses.

Best Management Practices (BMPs) are a system of practice or methods that are designed to reduce or prevent water pollution. Wherever land management activities (road building, timber harvest, etc.) Threaten to impair water quality for this project BMPs will be prescribed and implemented.

Rock Pits

The design of rock pits visible from the Wrangell Narrows, along Roads 6355 and 43520, would incorporate features such as screening and rehabilitation of pits to mitigate visual impact. Rock pit and roadside rehabilitation would be applied as needed and may include the planting of tree seedlings and spraying of rock weathering agents to allow a better blending with the natural surroundings.

Logging Camps

Due to the area's proximity to the City of Petersburg, no logging camps were considered necessary to implement the project. No potential areas within the South Lindenberg area were identified as potential logging camp sites.

Sort Yards

One potential sort yard site was identified at the intersection of Road 43500 and Road 6350 located within the Duncan Creek drainage. The site would require rock overlay of quarry rock, perimeter ditching, and catchment basins; and where appropriate, protection measures would be taken to prevent penetration of oil and other deleterious materials into the soil. Existing sort yard and service areas are located on existing Road 6350.

Road Location

Roads were located using best management practices (BMPs) to minimize soil and water resource impacts (See Road Descriptions in Appendix B). Road locations avoid alluvial floodplains and landslide prone areas to the best possible extent. Roads were located on footslopes through noncommercial forest land to avoid construction in muskeg. Stream crossings were located perpendicular to the channel to minimize the amount of clearing within the stream influence. Full bench road construction and endhauling of excess excavated material would be required on designated areas for soil stability.

Reserve Trees

Most harvest units would contain reserve tree clumps of approximately 0.5 to 1.0 acre, where trees would be left uncut. These clumps would be left to provide structural diversity for wildlife and a genetic legacy for the future stand. This measure was also recommended by the project landscape architect to soften the visual effects of large openings. See Unit Descriptions in Appendix A for specific areas where reserve tree clumps are proposed.

Snag Retention

Where feasible and safe, snags would be retained in all harvest units to provide wildlife habitat for cavity nesting birds and a future downed woody material source. Opportunities to retain snags would primarily exist in the reserve tree clumps described previously.

Wildlife Retention Areas

As required under the Forest Plan (USDA Forest Service, 1985-1986), wildlife retention areas (WRAs) are included under each alternative to ensure that a minimum amount of old-growth habitat remains after the proposed harvest. For the South Lindenberg Timber Sale, these WRAs were designed and located to also follow guidelines in *A strategy for Maintaining Well-Distributed, Viable Populations of Wildlife Associated with Old-Growth Forests in Southeast Alaska* (Suring et al., 1992), often referred to as the "V-Pop" strategy which was developed to ensure the viability of old-growth dependent wildlife species in Southeast Alaska. The specific configuration of WRAs varies, however, by alternative.

Cultural Resources

All known or discovered cultural sites would be protected as required by statute. The Timber Sale Contract would require immediate protective measures, if additional sites are discovered during timber harvesting and road construction operations.

Opportunities

Many of the enhancement opportunities identified for the alternatives may be possible through funding under the Knutson-Vandenburg (KV) Act of 1930. The KV Act, as amended by the National Forest Management Act (NFMA) of 1976, allows the Forest Service to collect receipts from the timber sales for Sale Area Improvement (SAI) projects. Top priority for these funds is to ensure stand regeneration. Subsequent projects, such as precommercial thinning, recreation development, fisheries enhancement, wildlife enhancement, and soil stabilization are prioritized and listed on the SAI plan. If funding is not available from KV receipts for resource enhancements projects, then these projects could be added to the regular program budget. The SAI plan will be developed after the Final EIS and ROD are signed.

The only project within the South Lindenberg area identified by the ID Team that the SAI plan should consider in addition to the generally required projects is the removal of a fish barrier on Duncan Creek.

100 Acre Limitations

No alternative contains harvest units that exceeded 100 acres. The ID Team modified unit sizes and combinations to limit the size of harvested openings to under 100 acres. Regional direction in the Alaska Regional Guide (USDA Forest Service, 1983) limits the size of created openings in the hemlock-Sitka spruce forestry type of coastal Alaska to 100 acres, unless excepted under specific conditions.

Alternatives Considered In Detail

The ID Team developed four action alternatives for detailed analysis. Alternatives address the purpose and need of the South Lindenberg harvest and respond to resource management opportunities such as timber harvest and recreational opportunities. Each alternative provides a mix of resource use and protection, emphasizing different resource values based on the theme for which the alternative was developed.

If an action alternative is selected and a timber sale is implemented for the South Lindenberg area, minor changes to units and roads are likely. Maps displayed at the end of this chapter (Figures 2-1 to 2-5) show general size and location of proposed harvest units. Timber volumes presented for each of the action alternatives are based upon information available at this time. An intensive cruise will be conducted on the acreage made available for the timber sale, which would determine sale contract timber volume. A description of each alternative is provided which includes:

- the intent of the alternative,
- the guidelines used in selecting units and roads consistent with the themes,
- a summary discussion of how the alternative addresses the issues raised in public scoping, as described in Chapter 1,
- a table summarizing the volume of timber harvest by VCU and the acres to be harvested by logging method, and
- a table showing specified spur and total road mileage by alternative.

After the alternatives were developed, each was evaluated relative to the purpose and need, environmental impacts, and potential benefits or opportunities. This process resulted in Alternative 5 being selected as the Preferred Alternative by the Forest Service. A more detailed discussion of the selection process follows the descriptions of alternatives.

No Action Alternative 1

This alternative does not propose any timber harvest or road construction in the South Lindenberg area. Substitute volume is not currently available for offer in a manner that will sustain the current level of timber processing capabilities within the Tongass National Forest. Management of the South Lindenberg area would continue as it currently exists. A no action alternative is required in an EIS under NEPA. This alternative serves as the benchmark by which effects of all action alternatives are measured.

Issues associated with this alternative include:

Issues Related to Timber Production

Timber Management: There would be no harvesting of old-growth timber stands. The proportion of second-growth acres would remain at 15.5 percent of the suitable timber land base.

Harvest Economics: The 40 MMBF of Stikine Area's independent timber sale program would not be available in Fiscal Year 1997. The Small Business Administration (SBA) goal of 100 MMBF set by the Regional Forester and the SBA in 1995 would not be attained.

Issues Related to Fisheries

Soils: There would be no change from the existing condition.

Watersheds: There would be no additional potential impacts to water quality and fish habitat.

Issues Related to Old-Growth Forests

Wildlife: There would be no changes in habitat suitability as a result of timber harvest and road construction. Marten populations would be maintained at present levels. Conditions for deer would remain unchanged.

TES Species and Species of Concern: There would be no new timber harvest or road construction in the vicinity of known active goshawk or murrelet nests. Exiting habitat for wolf and its primary prey, deer, would be maintained.

Biodiversity: Alternative 1 would leave intact the existing old-growth forests in the proposed Medium Wildlife Retention Area (Colorado Creek drainage), Skogs Creek drainage, and north side of Duncan Creek. No further fragmentation of old-growth blocks would occur.

Issues Related to Society

Subsistence: Subsistence use would not be affected.

Recreation: There would be no change in recreational opportunities. Acres in the semi-primitive non-motorized category would remain at 22,772 acres, 39 percent of the total land area in the project.

Visual Resource: There would be no changes to the visual appearance of the South Lindenberg area as a result of timber harvesting or road construction. Cumulative effects of additional harvesting would not occur. Recovery of previously harvested areas would continue.

Alternative 2

Under this alternative 1,734 acres would be harvested in 50 units for 41.1 million board feet (MMBF) of net sawlog volume. To implement this alternative approximately 21 miles of new road would be constructed. Figure 2-1 shows the spatial relationship between roads, units, and other geographic features of the South Lindenberg area.

Theme

The theme of this alternative was to provide a relatively cost-efficient timber harvest. Emphasis was given to accessing commercial forest land with cable logging and minimizing the amount of new road construction. Clearcutting is the silvicultural prescription proposed almost exclusively. Table 2-1 summarizes the proposed timber harvest by logging method and VCU, and Table 2-2 lists the miles of road by road class for Alternative 2.

Table 2-1
Summary of Proposed Timber Harvest for Alternative 2 (by VCU and Logging Methods)

VCU	Estimated Volume (MBF)	Highlead (acres)	Skyline (acres)	Shovel (acres)	Helicopter (acres)	Total (acres)
437	15,640	395	209	11	87	702
439	13,480	99	391	33	76	599
447	11,970	193	233	7	-	433
448	0	0	0	0	0	0
Total	41,090	687	833	51	163	1,734
Percent of Total		40	48	3	9	100

Source: South Lindenberg Database

Guidelines

Guidelines used in selecting units and roads which would be consistent with the theme of dispersing activities include the following:

- emphasize long-term timber production and road access through developing access to watersheds in the South Lindenberg area;

Table 2-2
Road Mileage Constructed for Alternative 2

Road Class	Miles of Road
Forest Development Roads: Pre-haul Maintenance	7.4
Forest Development Roads: New Construction	15.5
Forest Development Roads: Total	22.9
Temporary Roads (Spurs)	5.4

Source: Dalton, 1996

- minimize the amount of volume to be yarded by helicopter; and
- avoid costly road construction to low-volume areas, particularly the Skogs Creek drainage.
- Issues associated with this alternative include:

Issues Related to Timber Production

Timber Management: Alternative 2 would result in the conversion of 1,730 acres of old-growth, non- net growing forest to an even-aged, second-growth forest. There would be no group selection harvests under this alternative. Four acres would be partial cut in a sanitation harvest. Second-growth acres would increase to 4,958, 23.7 percent of the suitable landbase.

Harvest Economics: This alternative would yield the second-highest predicted stumpage value and have the lowest logging costs of all the action alternatives. This alternative would have the least amount of volume to be harvested by helicopter and no volume that would be harvested under a group selection prescription.

Issues Related to Fisheries

Soils: Alternative 2 would have the second-lowest sediment delivery potential of all the action alternatives. Harvesting would occur in units 32 and 35, potentially affecting Duncan Creek, and units 133, 134 and 136, potentially affecting Colorado Creek. This alternative would have 0.3 miles of new road construction on high hazard soils. Under this alternative, 82 acres of high hazard soils would be harvested, the lowest number of acres of all the action alternatives.

Watersheds: Alternative 2 would result in 12.8 miles of Class 3 streams within proposed harvest units, the least of all the action alternatives. This alternative would also have the least number of stream crossings than all the action alternatives.

Issues Related to Old-Growth Forests

Wildlife: This alternative proposes a road through the proposed wildlife retention area (WRA) at the southern tip of the South Lindenberg Peninsula to harvest Volume Class 6 forest which is high-value habitat for deer and marten.

TES Species and Species of Concern: Under Alternative 2, a small amount of timber harvest and road building would occur in the 6,000 acre foraging area (FA) for the Mountain Point and Mitchell Creek Queen Charlotte goshawk nesting sites. Heavy harvest of old-growth forest would occur in areas where high levels of marbled murrelet activity and occupancy behavior were observed. Relatively low levels of new road construction would minimize risk for marbled murrelet nest predation and wolf mortality. However, the loss of old-growth forest habitat in the Colorado Creek drainage would reduce the carrying capacity of deer, a main prey item for wolves on the peninsula. Two units of high murrelet use would be harvested.

Biodiversity: This alternative would locate harvest units in the proposed Medium Wildlife Retention area in the southern end of the South Lindenberg area, which is currently unroaded, the only alternative proposing harvest in this area. There would be no roads or harvest units located in the Skogs Creek drainage. Alternative 2 would harvest the least acres (161) in the Duncan Creek watershed.

Issues Related to Society:

Subsistence: Alternative 2 would result in increased access to the area north of Duncan Creek and in the southern portion of the peninsula near Colorado Creek. At the same time carrying capacity for deer in these areas would be reduced.

Recreation: Alternative 2 would reduce the number of semi-primitive, non-motorized acres to 10,369, which is second to Alternative 5 in the area remaining in this ROS Class.

Visual Resource: Alternative 2 would achieve the visual management direction set forth in the Draft Forest Plan Revision (USDA Forest Service, 1991b), with the exception of Unit 107 as seen from Raven's Roost Cabin and Unit 109 as seen from Papke's Landing. For these units, a modification VQO would be achieved. This alternative concentrates nearly all (99.8 percent) of the proposed harvesting in clearcut units. Harvesting is basically distributed throughout the project area with some moderate to large clearcuts visible from Duncan Canal. Several small clearcuts would be seen from the Wrangell Narrows. Within the Wrangell Narrows viewshed, this alternative would have more acres harvested than the other action alternatives.

Alternative 3

Under this alternative 1,725 acres would be harvested in 52 units for 40.2 MMBF of net sawlog volume. To implement this alternative approximately 26 miles of road would be constructed. Figure 2-3 shows the spatial relationship between roads, units, and other geographic features of the South Lindenberg area. Table 2-3 summarizes the proposed timber harvest by logging method and VCU, and Table 2-4 lists the miles of road by road class for Alternative 3.

Table 2-3
Summary of Proposed Timber Harvest for Alternative 3 (by VCU and Logging Methods)

VCU	Estimated Volume (MBF)	Highlead (acres)	Skyline (acres)	Shovel (acres)	Helicopter (acres)	Total (acres)
437	13,780	370	136	11	91	608
439	17,480	99	417	23	233	773
447	8,920	60	175	6	102	344
448	0	0	0	0	0	0
Total	40,180	529	728	41	427	1,725
Percent of Total		31	42	2	25	100

Note: Due to rounding errors, sum of acres shown for each harvest type or VCU do not always equal total.

Source: South Lindenberg Database

Table 2-4
Road Mileage Constructed for Alternative 3

Road Class	Miles of Road
Forest Development Roads: Pre-haul Maintenance	8.8
Forest Development Roads: New Construction	20.3
Forest Development Roads: Total	29.1
Temporary Roads (Spurs)	5.8

Source: Dalton (1996)

Theme

This alternative was designed to minimize the visual effects of timber harvest in areas seen from Duncan Canal and Wrangell Narrows. Emphasis was given to designing units that would achieve the Inventory Visual Quality Objectives.

Guidelines

Guidelines for timber harvesting were taken from the Draft Forest Plan Revision (USDA Forest Service 1991b) and included guidelines on silvicultural methods, unit size, cumulative visual disturbance, and height to adjacent mature stands, which were based on the Visual Quality Objectives (VQO's) and Visual Adsorption Capability (VAC) settings. Under Alternative 3, direction was given to locate harvest units outside areas that could be seen from Duncan Canal or Wrangell Narrows. When units were located in seen areas, an emphasis was given to group selection harvests.

Issues associated with this alternative include:

Issues Related to Timber Production:

Timber Management: Alternative 3 would result in the conversion of 1,619 acres of old growth forests to a young, even-aged condition. Approximately 642 acres would have between 15 to 20 percent (approximately 102 acres) of their volume harvested in small groups (group selection) approximately 1.5 to 2.5 acres in size. Four acres would be partial cut in a sanitation harvest. Second-growth acres would increase 4,943, 23.7 percent of suitable land base.

Harvest Economics: This alternative would yield the lowest predicted stumpage value of all the action alternatives. This alternative has the highest road construction costs and the second highest logging costs.

Issues Related to Fisheries

Soils: Alternative 3 would have the second-highest sediment delivery potential of all the action alternatives. Harvesting would occur in units 32 and 35, potentially affecting Duncan Creek, and locate roads and units in the Skogs Creek drainage. This alternative would have 0.5 miles of new road construction on high hazard soils, the same as Alternative 4. Under this alternative 141 acres of high hazard soils would be harvested, similar to alternatives 4 and 5. However, this alternative includes several helicopter units, where potential impacts would be less than expected from cable logged units.

Watersheds: Alternative 3 would have 16.4 miles (the most) of Class 3 streams miles located within proposed harvest units. This alternative would require 103 stream crossings, the most of all the action alternatives.

Issues Related to Old-Growth Forests

Wildlife: This alternative would create the highest road density and the highest potential effect on the recovery of deer populations, and would most reduce the habitat capability for marten on the peninsula. An intermediate amount of Volume Class 6 forest (the best winter range habitat for deer) would be harvested; harvest would be concentrated near the LTF and along the road south of the LTF. This alternative, however, would harvest the most old growth acres in the Duncan Creek Watershed.

TES Species and Species of Concern: This alternative would locate a road within 330 feet of the active goshawk nest near Mountain Point and includes harvest of several units near the Mitchell Creek nest site. Areas believed to be of higher priority for marbled murrelet would be harvested. The high density of new roads proposed is predicted to impact wolves and would be expected to increase nest predation of marbled murrelet along the forest edge.

Biodiversity: Alternative 3 would locate roads and harvest units in the Skogs Creek drainage, similar to Alternative 4. There would be no units or roads located in the proposed Medium Wildlife Retention Area, in the southern end of the South Lindenberg area. Alternative 3 would be intermediate in the number of acres harvested (335 acres) in the Duncan Creek watershed.

Issues Related to Society

Subsistence: Harvest in traditional subsistence areas would be the highest of all the action alternative. Roads would be constructed and units harvested in the Skogs Creek drainage and the area north of Duncan Creek, increasing access for hunters but decreasing carrying capacity for deer in this area.

Recreation: Alternative 3 would result in the least amount of acres (7,936) in the semi-primitive, non-motorized category.

Visual Resource: Alternative 3 would achieve the visual management direction set forth in the Draft Forest Plan Revision (USDA Forest Service, 1991b). This alternative would achieve the more restrictive Inventory Visual Quality Objectives, except in the Duncan Creek area. Alternative 3 distributes harvest throughout the study area, similar to Alternative 2, but places a higher emphasis on group selection harvest, especially within the Wrangell Narrows viewshed. Units and roads would be located in the Skogs Creek drainage, but would achieve the VQO for the area. Alternative 3 would have less acres harvested than Alternative 2, but more than 4 and 5.

Alternative 4

Under this alternative 1,815 acres would be harvested in 50 units, for 40.2 MMBF of net sawlog volume. To implement this alternative approximately 24 miles of road would be constructed. Figure 2-4 shows the spatial relationship between roads, units, and other geographic features of the South Lindenberg area. Table 2-5 summarizes the proposed timber harvest by VCU and logging method, and Table 2-6 lists the miles of road by road class for Alternative 4.

Table 2-5

Summary of Proposed Timber Harvest for Alternative 4 (by VCU and Logging Methods)

VCU	Estimated Volume (MBF)	Highlead (acres)	Skyline (acres)	Shovel (acres)	Helicopter (acres)	Total (acres)
437	16,440	387	202	11	132	732
439	19,770	99	417	33	348	897
447	4,010	70	80		36	186
Total	40,220	556	699	44	516	1,815
Percent of Total		31	9	2	28	100

Source: South Lindenberg Database

Table 2-6
Road Mileage Constructed for Alternative 4

Road Class:	Miles of Road
Forest Development Roads: Pre-haul Maintenance	7.7
Forest Development Roads: New Construction	18.8
Forest Development Roads: Total	26.5
Temporary Roads (Spurs)	5.3

Source: Dalton (1996)

Theme

The major theme of this alternative was to protect deer populations from habitat loss, particularly in known subsistence use areas.

Guidelines

Guidelines used in selecting harvest units and roads in this alternative included:

- locate harvest units outside areas that have had a history of subsistence use and minimize additional harvested areas along the Wrangell Narrows;
- do not extend Road 6355 into the southern end of the South Lindenberg peninsula; and
- avoid harvest of high value deer habitat near the Tonka LTF.
- Issues associated with this alternative include:

Issues Related to Timber Production

Timber Management: Alternative 4 would result in the conversion of 1,788 acres of old growth forests to a young, even-aged condition. Approximately 115 acres would have between 15 to 20 percent (approximately 23 acres) of their volume harvested in small groups approximately 1.5 to 2.5 acres. Four acres would be partial cut in a sanitation harvest. Second-growth acres would increase to 5,026, 24.1 percent of the suitable land base.

Harvest Economics: This alternative has the second lowest predicted net stumpage value of all the action alternatives. Logging costs are the highest, and road construction costs are the second highest.

Issues Related to Fisheries

Soils: Alternative 4 would have the highest sediment delivery potential of all the action alternatives. Harvesting would occur in units 32 and 35, and roads and units would be located in the Skogs Creek drainage. This alternative would have 0.5 miles of new road construction on high hazard soils, the same number of miles as Alternative 3. Under this alternative 140 acres of high hazard soils would be harvested, approximately the same number of acres as alternatives 3 and 5. However, this alternative includes several helicopter units, where potential impacts would be less than would be expected in cable-logged units.

Watersheds: Alternative 4 would have 14.1 miles of Class 3 streams located within proposed units, the second-lowest of the action alternatives. This alternative would require 92 stream crossings, second-highest of the action alternatives.

Issues Related to Old-Growth Forests

Wildlife: Alternative 4 proposes no harvest of valuable deer winter habitat in the southern part of the peninsula, but would harvest in the Duncan Creek drainage. Construction of new roads would increase hunting pressure on deer in the future, and would be unfavorable for marten. Harvest areas proposed under this alternative would reduce habitat connectivity for marten on the peninsula.

TES Species and Species of Concern: Alternative 4 would locate Road 43520 within 330 feet of the Mountain Point Queen Charlotte goshawk nest and proposes harvest of several units in the vicinity of the Mitchell Creek nest site. Timber harvest and road construction in Skogs Creek would remove high value marbled murrelet habitat and would be unfavorable for wolf.

Biodiversity: Alternative 4 would locate roads and harvest units in the Skogs Creek drainage, similar to Alternative 3. No harvest would occur in the Proposed Medium Wildlife Retention Area in the southern portion of the South Lindenberg area. Proposed harvest in the Duncan Creek watershed would be highest (459 acres) of all the action alternatives.

Issues Related To Society

Subsistence: Alternative 4 would result in the least number of harvested acres in traditional subsistence use areas. Additional access and harvest units would occur in the Skogs Creek drainage and in the Duncan Creek drainage, which potentially could increase hunting pressure and reduce the carrying capacity for deer in these areas. The habitat suitability index for deer would be the highest under this alternative.

Recreation: This alternative would result in the second lowest number of acres in the semi-primitive, non-motorized category (7,906 acres).

Visual Resource: Alternative 4 would achieve the visual management direction set forth in the Draft Forest Plan Revision (USDA Forest Service, 1991b). Units and roads would be located in the Skogs Creek drainage but would achieve the VQO for the area. Alternative 4 would have the least amount of acres harvested in the Wrangell Narrows viewshed. This alternative (and Alternative 5) would have the greatest visual effect on the Duncan Canal viewshed.

Alternative 5

Under this alternative 1,727 acres would be harvested in 51 units for 40.3 MMBF of net sawlog volume. To implement this alternative 17 miles of road would be constructed. Figure 2-5 shows the spatial relationship between roads, units, and other geographic features of the South Lindenberg area. Table 2-7 summarizes proposed timber harvest by VCU and logging method, and Table 2-8 lists the miles of road by road class for Alternative 5.

Table 2-7
Summary of Proposed Timber Harvest for Alternative 5 (by VCU and Logging Methods)

VCU	Estimated Volume (MBF)	Highlead (acres)	Skyline (acres)	Shovel (acres)	Helicopter (acres)	Total (acres)
437	13,030	322	139	7	111	579
439	18,420	99	417	33	276	825
447	8,890	141	116	6	60	323
448	0	0	0	0	0	0
Total	40,340	562	672	46	447	1,727
Percent of Total		33	38	3	26	100

Source: South Lindenberg Database

Table 2-8
Road Mileage Constructed for Alternative 5

Road Class:	Miles of Road
Forest Development Roads: Pre-haul Maintenance	9.3
Forest Development Roads: New Construction	12.4
Forest Development Roads: Total	21.7
Temporary Roads (Spurs)	4.6

Source: Dalton (1996)

Theme

This alternative was designed to minimize old growth and biodiversity impacts and protect to the extent possible populations of old-growth dependent species for the life of the project. This alternative would use a strategy of providing for small WRAs in each VCU and a medium WRA in the lower peninsula.

Guidelines

Guidelines in selecting units and roads in this alternative included:

- avoid harvest in the North Mitchell Creek area to minimize conversion of old growth forests in the vicinity of a known goshawk nest;

- avoid harvest and road construction in the Skogs Creek drainage, an unroaded area, due to relatively high marbled murrelet activity, presence of a goshawk nest along the major access road, and location of a sensitive plant population along the major access road;
- maximize Wildlife Retention Areas, including locating harvest outside a proposed Medium WRA in south end of Peninsula;
- concentrate harvest in areas that had already been fragmented by road construction and timber harvest;
- minimize road density; and
- avoid areas potentially affecting highly sensitive fish habitat.

Issues associated with this alternative include:

Issues Related to Timber Production

Timber Management: Alternative 5 would involve the conversion of 1,661 acres of old growth forest to a young, even-aged condition. Approximately 413 acres would have 15 to 20 percent (approximately 62 acres) of their area harvested in small groups of approximately 1.5 to 2.5 acres. Approximately 4 acres would be partial cut in a sanitation prescription. Second-growth acres would increase to 4,947 acres, 23.7 percent of the suitable land base.

Harvest Economics: Alternative 5 would result in the highest predicted net stumpage of all the action alternatives. This alternative has the cheapest road construction costs and second-lowest logging costs.

Issues Related to Fisheries

Soils: Alternative 5 would have the least sediment delivery potential of all the action alternatives. Harvesting would occur in units 32 and 35, which could potentially affect Duncan Creek, but avoids locating units and roads in sensitive locations in Skogs Creek and Colorado Creek. This alternative would have 0.3 miles of new road construction on high hazard soils, the same as Alternative 2. Under this alternative 140 acres of high hazard soils would be harvested, approximately the same number of acres as alternatives 3 and 4. However, this alternative includes several helicopter units, where potential impacts are expected to be less than that of cable-logged units.

Watersheds: Alternative 5 would have 15.9 miles of Class 3 streams within proposed harvest units, second-highest of all alternatives. This alternative would involve 55 stream crossings, second-lowest of all alternatives.

Issues Related to Old-Growth Forests

Wildlife: Alternative 5 would have the lowest road density of all alternatives and would maintain larger unfragmented blocks of old-growth. These conditions are favorable for maintaining healthy deer and marten populations on the peninsula. This alternative would harvest the highest amount of Volume Class 6 habitat in Duncan Creek Watershed.

TES Species and Species of Concern: This alternative would not locate a road adjacent to the known active goshawk nest near Mountain Point. Construction of the lowest road density under this alternative is favorable for wolf and marbled murrelet. Skogs Creek drainage would remain intact, preserving valuable wolf and marbled murrelet habitat.

Biodiversity: Because this alternative was specifically designed to minimize adverse effects to biodiversity elements, Alternative 5 would be the most favorable. There would be no harvest or road construction in the Skogs Creek or Colorado Creek drainage, leaving intact the proposed Medium WRA in the southern end of the Lindenberg Peninsula and existing unfragmented forest in the Skogs Creek drainage. Alternative 5 would be intermediate in the number of acres harvested (388 acres) of all the action alternatives.

Issues Related to Society

Subsistence: This alternative ranks second-highest in avoiding acres of harvest in traditional subsistence use areas. Alternative 5 would result in increased access and harvest in the Duncan Creek drainage, which would result in increased hunting pressure and some loss of deer carrying capacity. Of all the alternatives, Alternative 5 would minimize the potential effects of wolf predation on deer populations.

Recreation: This alternative would result in the most acres in the semi-primitive, non-motorized category (11,444 acres).

Visual Resource: Alternative 5 would achieve the visual management direction set forth in the Draft Forest Plan Revision (USDA Forest Service, 1991b), with the exception of Unit 107 as seen from Raven's Roost Cabin. For this unit, a modification VQO would be achieved. Alternative 5 would have more of a visual effect on the Wrangell Narrows than alternatives 3 and 4, and less than 2. In the Duncan Canal viewshed, the visual effect of Alternative 5 would be similar to Alternative 4.

Identification of the Forest Service Preferred Alternative

The Stikine Area Forest Supervisor, in consultation with the ID Team, selected a preferred alternative. The benefits and impacts were evaluated by resource with particular consideration as to how alternatives respond to significant issues. Based on this evaluation the Stikine Area Forest Supervisor identified Alternative 5 as the preferred alternative. Although all alternatives met the purpose and need of providing approximately 40 million board feet, Alternative 5 embodied several characteristics that resulted in it being the alternative selected as the "preferred alternative." These characteristics included:

- maximum protection to known Queen Charlotte goshawk nests at Mountain Point and Mitchell Creek;
- least potential impact to deer because of lowest road density and moderate amount of acres of Volume 6 harvested;
- allowed for future options of maintaining roadless character of both the Colorado and Skogs Creek areas;
- avoids harvest in productive fisheries area of Colorado Creek;
- least potential impact of sedimentation to streams by avoiding road construction and harvesting in Skogs Creek and Colorado Creek;
- second highest net timber value of all the action alternatives;
- allows for the maintenance of a medium WRA in South Lindenberg Peninsula;
- relatively low impacts to subsistence users; and
- would meet visual quality objectives, although additional mitigation could lessen cumulative visual effects in the Wrangell Narrows viewshed.

Table 2-9
South Lindenberg Alternative Summary

Element of Proposal	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
TIMBER HARVEST RELATED ELEMENTS					
Timber Management					
Total volume harvested (MMBF)	0	41.1	40.2	40.2	40.3
Area proposed for harvest					
Acres	0	1,734	1,725	1,815	1,727
Cumulative acres	3,245	4,958	4,943	5,026	4,947
Suitable acres (percent of 20,950 acres)					
- Proposed South Lindenberg	0	8.3	8.3	8.7	8.3
- Cumulative	15.5	23.7	23.7	24.1	23.7
Area harvested (by cutting method)					
Clearcut acres	0	1,730	1,619	1,788	1,661
Partial cut acres[1]	0	4	646	119	417
Area harvested (by logging system)					
Shovel acres	0	51	41	44	46
Highlead acres	0	687	529	556	562
Skyline acres	0	833	728	699	672
Helicopter acres	0	163	427	516	447
Road Construction					
Miles of FDR (Forest Development Road) Construction	0	15.5	20.3	18.8	12.4
Cumulative miles of FDRs	47.1	62.6	67.4	65.9	59.5
Miles of spur road construction	0	5.4	5.8	5.3	4.6
Harvest Economics					
Estimated mid-market net value ($/MBF)	NA	-$66	-$95	-$94	-$65
Number of jobs generated	NA	356	348	347	345
Regional income generated ($ million)	NA	$13.4	$13.1	$13.0	$13.0
Income contribution to GNP ($ million)	NA	$32.0	$31.4	$31.2	$31.1
Estimated current net value ($/MBF)[2]	NA	$189	$160	$161	$190

Table 2-9
South Lindenberg Alternative Summary Continued

Element of Proposal	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
FISHERIES RELATED ELEMENTS					
Soils					
Acres of high hazard soils harvested	0	82	141	141	140
Miles of road located on high hazard soils	0	0.3	0.5	0.5	0.3
Fisheries and Watersheds					
Class III streams miles affected this entry within proposed units	0	12.8	16.4	14.1	15.9
Number of Class I and Class II stream crossings	0	8	28	28	6
Number of Class III stream crossings	0	46	75	64	55
OLD-GROWTH FOREST ELEMENTS					
Wildlife					
Cumulative FDR and spur road density (mi/mi^2)	0.64	0.88	0.93	0.91	0.83
Roads and units located in Skogs Creek drainage	No	No	Yes	Yes	No
Roads and units in proposed medium WRA at southern end of peninsula	No	Yes	No	No	No
Roads and units in small WRAs	No	Yes	Yes	Yes	No
Percent change of high-value habitat for marten	0	-11	-10	-10	-11
TES Species					
Percent old-growth harvested in goshawk 6,000-acre FAs (average over the 3 nest sites)	0	7	7	8	5

[1]Includes area of total unit. Only 15-20% of each unit would actually be cut.
[2]From Thompson (1996).

Table 2-9
South Lindenberg Alternative Summary Continued

Element of Proposal	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Road segment and/or spur road located by Mountain Point goshawk nest	No	No	Yes	Yes	No
Road segment and/or spur road located by Mitchell Creek goshawk nest	No	Yes	Yes	Yes	No
Road segment and/or spur road located by Duncan Creek goshawk nest	No	No	No	No	No
Biodiversity					
Old-growth acres harvested	0	1,732	1,722	1,812	1,724
Reduction in interior old-growth acres	0	1,297	1,803	1,492	1,683
Percent volume class 6 old-growth harvested	0	20	14	10	16
SOCIETAL ELEMENTS					
Subsistence					
Percent change of medium-value habitat for black-tailed deer	0	-9	-7	-6	-8
Recreation					
Acres retained of recreational opportunity classes:					
Semi-primitive non-motorized	22,772	10,369	7,26	27,906	11,444
Semi-primitive motorized	11,363	10,679	10,548	10,548	11,093
Roaded modified	24,182	37,269	40,507	39,863	35,780
Visual Quality					
Wrangell Narrows Viewshed					
Number of units seen in middleground	0	13	9	2	12
Acres within units seen in middleground	0	282	139	50	245
Number of units seen in background	0	1	4	4	2
Acres within units seen in background	0	96	221	221	141
Duncan Canal Viewshed					
Number of units seen in middleground	0	2	2	2	2
Acres within units seen in middleground	0	149	149	149	149
Number of units seen in background	0	2	3	4	4
Acres within units seen in background	0	117	162	205	205

The following summary in Table 2-9 shows the principal elements of each alternative, including volume and acres harvested and miles of new road construction. Each alternative is listed with the number of acres by proposed logging system and how each alternative responds to the timber harvest economics issue is displayed. Each alternative varies in its respective effects on each resource. Table 2-9 summarizes the effects of each alternative with respect to each of the issues identified in Chapter 1. The principal issues summarized are fisheries related elements, old-growth forest elements and societal elements.

Each action alternative has a different group of units. Table 2-10 displays for each action alternative, the unit number and its corresponding number of acres.

Table 2-10
Harvest Unit and Acres by Alternative

Unit #	Unit Size (Acres)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
2	65	X	X	X	X
4	71	X		X	
6	99	X	X	X	X
16	50	X	X	X	X
19	32	X	X	X	X
20	43			X	X
21	9	X		X	X
24	52	X	X	X	X
26	14	X	X	X	X
28	37	X	X	X	X
31	45		X	X	X
32	44	X	X	X	X
34	30		X	X	X
35	26	X	X	X	X
36	86		X	X	X
37	14	X	X	X	X
39	25		X	X	X
41	29		X	X	X
42	18		X	X	X
43	21		X	X	X
44	54	X	X	X	X
46	31	X	X	X	X
55	54	X	X	X	
56M	70	X		X	
*57	74		X		
*58	115		X	X	
60	66	X	X	X	X
62	16	X	X	X	X
63	36	X	X	X	X
64	21		X	X	X
65	34	X	X	X	X
66	51	X	X	X	X
67	28		X	X	X
68	28	X		X	
69	96	X	X	X	X
71	15	X	X	X	X
85	13		X		
90	55		X	X	
93	23		X	X	
94	25		X	X	
96	12		X	X	
97	11		X	X	
* 104	73		X		X
105	65	X	X		X
106	51	X	X		X
107	49	X			X
*108	74		X		X
109	14	X			

Table 2-10
Harvest Unit and Acres by Alternative Continued

Unit #	Unit Size (Acres)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
*110	64		X		
111	44				X
114	31			X	
114M	13	X			
115	16			X	
116M	20	X			
*118	24				X
119	11	X			
120	10	X			
121	14	X			
*122	44		X		X
123	10	X			X
*124	86		X		
125	9	X			X
127	23	X			X
128	23	X	X		X
129	36	X			
133	39	X			
134	20	X			
136	26	X			
138	17	X	X	X	X
140	37	X	X	X	X
141	23	X	X	X	X
142	42	X	X	X	X
145	25	X		X	X
146	27	X	X	X	X
*147	112		X		X
148	31	X	X	X	X
**150	4	X	X	X	X

*Group Selection Units - approximately 15-20 percent of the unit area would be harvested
**Sanitation Unit
All Other Units are Clearcuts

Mitigation

The following mitigative measures would be required for implementing a timber harvest for the South Lindenberg area. The mitigative measures are applicable for all action alternatives. For mitigative measures specific to each unit and road segment, see Appendix A, Unit Descriptions, and Appendix B, Road Descriptions.

- If cultural sites are discovered once the sale is in operation, protective measures will be taken under the Timber Sale Contract.

- Pursuant to the Tongass Timber Reform Act of 1990, commercial timber harvesting would be prohibited within a buffer zone no less than one hundred feet in width on each side of all Class I streams and those Class II streams which flow directly into a Class I stream. To protect downstream

water quality, other Class II and all Class III streams would receive protection through a combination of directional felling of trees, partial suspension of logs, split-yarding, and removal of logging debris from stream channels.

- Full bench construction and end hauling of excavated material would be required on designated areas for soil stability and to prevent sediment from entering streams (see Road Descriptions, Appendix B).

- Group selection, reserve tree clumps, and snag retention would be implemented to help maintain wildlife habitat, structural diversity, biodiversity, and visual quality (see Unit Descriptions, Appendix A).

- For confirmed active nests of great blue herons, a 300-foot windfirm buffer will be maintained (not harvested) around the nest.

- For Queen Charlotte goshawk, timing restrictions will be put in place within 1/8 miles of a confirmed active nest to prevent mechanical disturbance (such as helicopter fly overs) associated with the timber sale.

- After use, temporary roads would be closed, water bars added at appropriate places, and drainage structures removed.

- Timing restrictions on in-stream road construction work would be implemented during critical periods to protect fishery resources (see Road Descriptions, Appendix B).

- Stream crossings of Class I and II streams would be constructed to allow fish passage.

- Partial suspension during log yarding would be required in designated harvest units to reduce soil disturbance, thus maintaining soil productivity and soil transport to streams (see Unit Descriptions, Appendix A).

- Bridges would be installed at designated stream crossings to minimize the amount of sediment entering stream channels (see Road Descriptions, Appendix B).

- To ensure that group selection units in the Wrangell Narrows viewshed are harvested in a manner that reduces visual impacts to the greatest extent possible, a landscape architect will be involved in planning the harvest of the units.

- If potential rock pits located near Mountain Point (Road 43520 Milepost 2.87 and 2.98) are to be developed, a landscape architect will be involved in the planning and design of the rock pit.

- Under all the action alternatives, unless used for future management activities, a road would be allowed to return to alder growth. Temporary roads would be blocked, pipes pulled, water barred and allowed to return to alder growth.

During the planning of this project, several mitigation measures were proposed, but not included in the final action alternative. These mitigation measures included:

- Closing and obliterating all proposed roads constructed for this project. This mitigation measure was proposed to eliminate potential long-term road effects on deer populations (wolf predation) and marten populations (trapping pressure). This measure was dropped because eliminating roads conflicted with the long-term transportation needs.

- Gating selected roads to relieve hunting or trapping pressure. This measure was dropped due to the problems associated with gating roads. The problems with gates included problems related to public perceptions of restricting access to public lands, maintaining a gate schedule, and vandalism.

- Prohibiting harvesting and road construction during the nesting period for marbled murrelets in certain units with high murrelet use. This measure was dropped because the species has no mandatory restrictions and because of the impracticality of limiting activities to the winter months. Also, there is a lack of information regarding harvesting and road construction impacts to the marbled murrelet, leaving doubts regarding effectiveness of the proposed mitigation.

- Prohibit cable yarding operations in certain units during egg incubation periods to prevent potential sedimentation in fish bearing streams. This measure was dropped because the costs associated with additional time restrictions on yarding were high compared to the low risk of potential sedimentation.

Monitoring

Monitoring would be conducted to determine if resource management objectives of the South Lindenberg harvest have been met. Monitoring results would be used to verify implementation and effectiveness of selected mitigative and protective measures in a timely manner. The following three types of monitoring were recognized in the development of the monitoring plan and are described below:

Implementation Monitoring

Sale Planning

Implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. Planning for implementation monitoring began with the design of this timber harvest. Specialists used on-the-ground inventories, computer inventories, and aerial photographs to prepare documents called unit design cards for each harvest unit. Road design cards were also prepared for each road segment. Resource specialists wrote their concerns and the cards and then described how the concerns could be addressed in the design of each unit and road segment. These documents will be the basis for determining whether recommendations were implemented for various aspects of this project.

Sale Preparation

The next step in this process involves incorporating the mitigative measures described in this EIS and ROD into the timber sale preparation and road design. Forest Service personnel experienced in sale preparation and road design would prepare a timber sale contract that reflects the measures prescribed by the ID Team. During this phase minor changes may be made to reflect the intent of the mitigative measures presented in this EIS. This preparation step would involve a “plan-in-hand” review of the timber sale by the Forest Service ID Team

to ensure that planned project elements have been incorporated into the Timber Sale Contract and Road Plans.

Sale Administration

Implementation monitoring continues through harvest and contract inspections by trained sale administrators and road inspectors as a routine part of project implementation. Through provisions contained in the timber sale contract, sale administrators and road inspectors ensure that the prescriptions contained on the unit and road cards are implemented. Sale administrators and contract inspectors have the authority to initiate remedial action to repair resource damage and suspend operations until problems have been corrected. This process ensure that project elements are implemented as designed and that standards and guidelines are implemented to protect soil productivity, water quality, fish habitat, and other resources.

Best Management Practices

BMPs are designed to directly or indirectly protect water quality, and minimize any adverse impacts on water quality that are associated with a land disturbing activity, such as timber harvest or road construction. For this project, monitoring will focus on timber and transportation-related activities. BMP implementation monitoring forms have been developed and are designed to be tailored to each site under consideration (Appendix C). BMPs to be monitored at a specific site are determined through a review of unit/road cards, fish habitat reports and other appropriate documentation.

Site selection for monitoring harvest units and road segments would be on a random basis to eliminate bias in selecting sites. However, if a unit or road has special resource concerns, it may be monitored in addition to the randomly selected sites. It has not yet been determined what percentage of road segments will be monitored. All harvest units and road segments are eligible to be selected for monitoring. The actual number selected would depend on the monitoring standards in effect on the Tongass National Forest at the time of this sale. Data collected through implementation monitoring will be entered in a BMP-monitoring database.

Pre-harvest issues of concern include land disturbing activities on high hazard soils (BMPs 13.2, 13.5, 13.16), road and landing location (BMPs 13.10, 14.3, 14.6 through 14.10 and others) and channel stability and streamside management, including stream temperature sensitivity (BMPs 12.6, 13.9, 13.16).

Effectiveness Monitoring

Effectiveness monitoring seeks answers about the effectiveness of design features or mitigation measures in protecting natural resources and their beneficial uses. The following displays the effectiveness monitoring that will be performed following implementation of an action alternative:

Timber Restocking

Objective: Ensure that restocking occurs within minimum time frames stated in the NFMA.

Desired Result: Adequately restocked timber stands.

Measurement: Stocking surveys within the first five years.

Evaluation: Determine that stocking is adequate. Prescribe planting if natural regeneration is inadequate.

Responsible Staff: District Silviculturist

Reserve Trees (Silviculture)

Objective: Determine the effectiveness of retaining reserve tree clumps and their ability to mitigate visual resource concerns.

Desired Result: Green tree clumps remain standing.

Measurement: Document the number of trees remaining and the windfirmness of residual trees. Measure and evaluate how residual trees have responded and the resulting visual quality.

Evaluation: Evaluate effectiveness of reserve tree clumps as a viable silvicultural prescription on a Forest-wide basis.

Responsible Staff: District Silviculturist

Group Selection (Silviculture)

Objective: Determine the effectiveness of group selection silvicultural prescription.

Desired Result: Residual trees are still standing and remain windfirm. Adequate regeneration is occurring in harvested groups at first, third, and fourth years.

Measurement: Document the effect of opening stand on windfirmness of residual trees. Measure stocking and species composition in harvested groups at first, third, and fourth years.

Evaluation: Evaluate effectiveness of group selection as a viable silvicultural prescription on a Forest-wide basis. Determine if stocking in groups is adequate. Prescribe planting if natural regeneration is inadequate

Responsible Staff: District Silviculturist

Stream Buffer Design

Objective: To determine if buffers left for protection of stream habitat and water quality were effective and remain windfirm.

Desired Result: Buffers standing as planned during layout and implementation.
Measurement: Periodically spot-check buffers following harvest for width and condition using field transects and photogrammetry.

Evaluation: Determine if buffers are largely intact and within 10 percent of prescribed width. Note recommendations for future buffer design to improvement protection of habitat and water quality.

Responsible Staff: District fisheries and wildlife staff.

Stream Crossing Structures

Objective: Determine if stream crossing structures permit the passage of fish on Class I streams.

Desired Result: Fish passage occurs and design of crossing structure is effective.

Measurement: For all Class I stream crossings, check for presence of fish above and below the site. Check that culvert installation meets guidelines in the Aquatic Habitat Management

Handbook, Appendix 5 (USDA Forest Service, 1986). This should be done during operations and post-harvest.

Evaluation: Evaluate effectiveness of stream-crossing structure. Note recommendations for improving installation or maintenance of structure.

Responsible Staff: District fisheries staff.

Snag Retention (Wildlife)

Objective: Determine the effectiveness of snag retention in maintaining wildlife habitat.

Desired Result: Snags retained in harvesting are still standing and are used by wildlife.

Measurement: Document wildlife use and windfirmness of remaining snags.

Evaluation: Evaluate effectiveness of snags in providing wildlife habitat (including nesting and foraging sites) and continued supply of downed woody material.

Responsible Staff: District Wildlife Biologist

Reserve Trees (Wildlife)

Objective: Determine the effectiveness of reserve tree clumps in maintaining wildlife habitat and providing a legacy of old-growth forest structure.

Desired Result: Green trees remain standing and provide wildlife habitat needs.

Measurement: Document wildlife use and windfirmness of residual trees.

Evaluation: Evaluate effectiveness of green tree retention in providing wildlife habitat, future supply of snags and continued supply of downed woody material.

Responsible Staff: District Wildlife Biologist.

Group Selection (Wildlife)

Objective: Determine the effectiveness of group selection in maintaining wildlife habitat and legacy of old growth forest structure.

Desired Result: Residual trees remain windfirm and provide habitat.

Measurement: Document wildlife use and windfirmness of residual trees.

Evaluation: Evaluate effectiveness of group selection in maintaining wildlife habitat.

Responsible Staff: District Wildlife Biologist.

Group Selection (Visual Resource)

Objective: Determine the effectiveness of group selection in meeting visual quality objectives.

Desired Result: Group selection harvests result in reducing the visual impacts of harvest.

Measurement: Document visual effects of group selection harvests from selected photo points.

Evaluation: Evaluate effectiveness of group selection in meeting visual quality objectives.

Responsible Staff: Forest Landscape Architect

Goshawk (Wildlife)

Objective: Ensure timber harvest activities do not adversely affect known goshawk breeding location(s).

Desired Result: Continued breeding activity of northern goshawk(s) in the South Lindenberg area.

Measurement: Observation of successful breeding activities as evidenced by establishment of occupied nest location(s).

Evaluation: Evaluate effectiveness of mitigative measures in preventing adverse impacts to breeding goshawk(s).

Responsible Staff: District Wildlife Biologist.

Validation Monitoring

Validation monitoring is conducted to check on assumptions made about resource effects and is usually carried out at the regional level. The only validation monitoring planned at this time for the South Lindenberg timber sale is for cultural resources:

Cultural Resources

Objective: Validate assumptions of cultural resources probability model.

Desired Result: No impact to cultural resources of group selection and snag retention in achieving the designated management objectives.

Measurement: On the ground observation of ground disturbance (e.g., road cuts).

Evaluation: Validate assumption of cultural resources probability model.

Figure 2-1. Alternative 1 - No Action, South Lindenberg Timber Sale

LEGEND

- Study Area Boundary
- Existing Roads
- Streams (Class I - III)
- Existing Managed Stands
- Non-National Forest

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

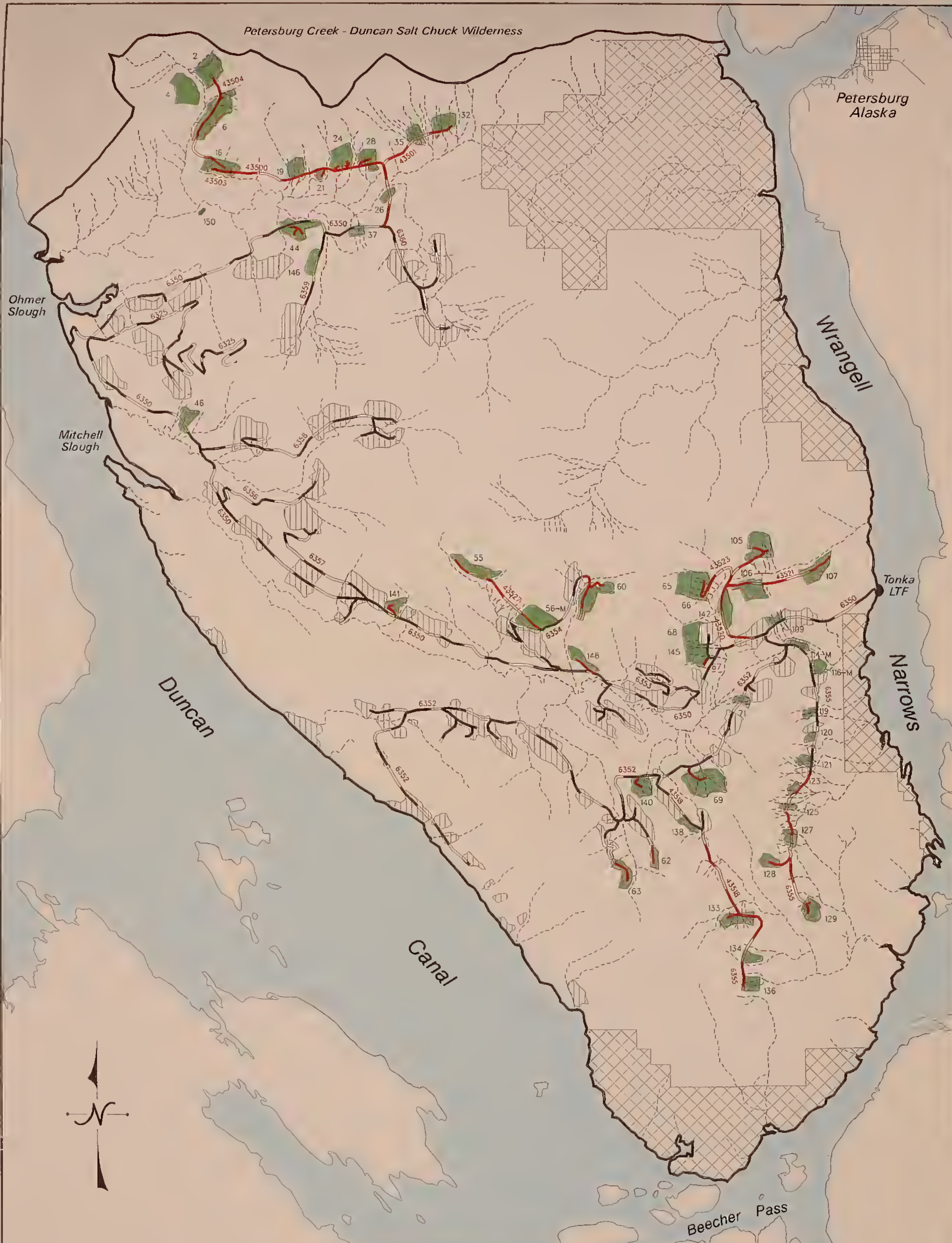


Figure 2-2. Alternative 2 - Proposed Harvest Units and Roads, South Lindenberg Timber Sale

LEGEND

- Study Area Boundary
- Existing Roads
- Proposed Roads
- Streams (Class I - III)
- Proposed Units
- Proposed Group Selection Units
- Existing Managed Stands
- Non-National Forest

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

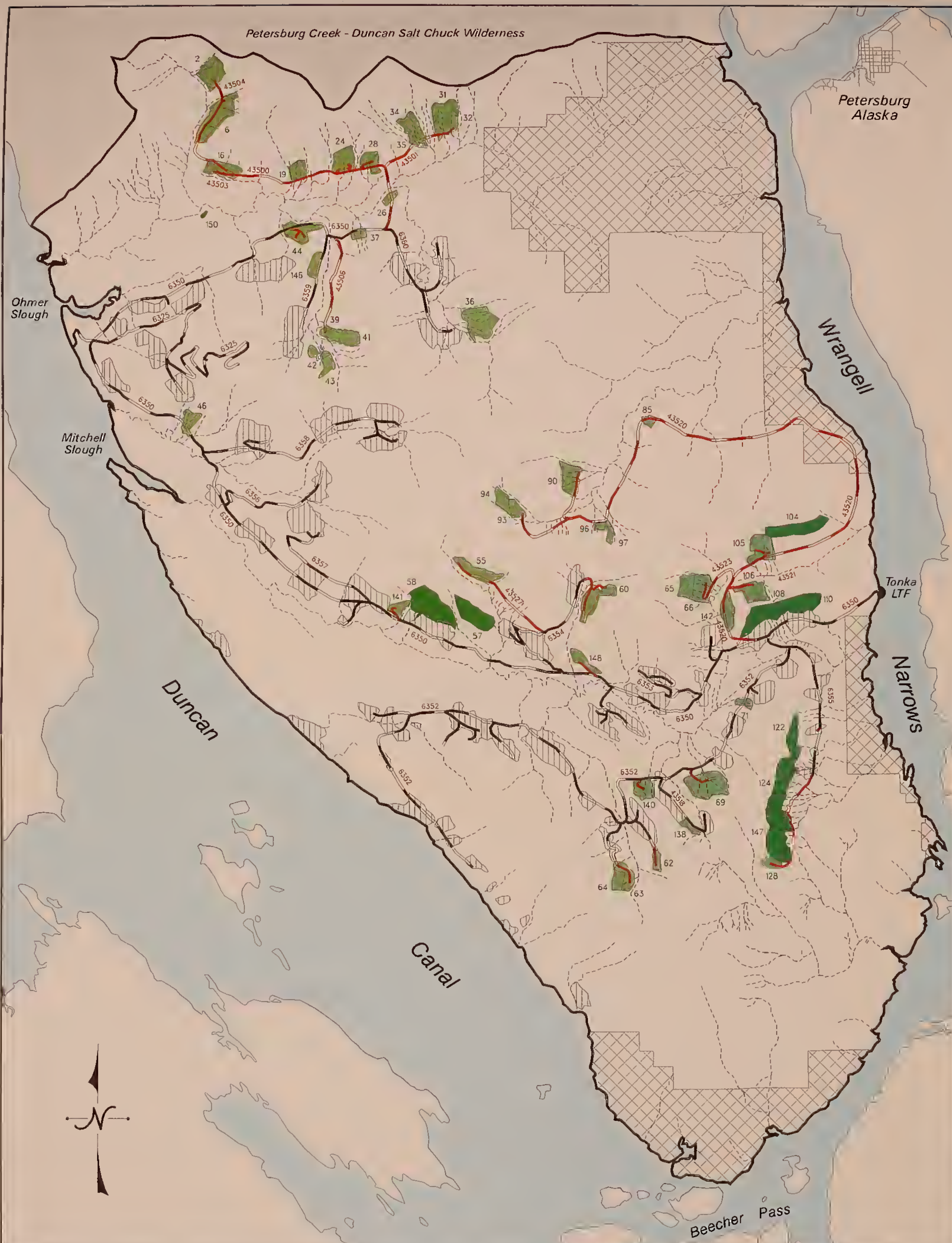


Figure 2-3. Alternative 3 - Proposed Harvest Units and Roads, South Lindenberg Timber Sale

LEGEND

Study Area Boundary
Existing Roads
Proposed Roads
Streams (Class I - III)
Proposed Units
Proposed Group Selection Units
Existing Managed Stands
Non-National Forest

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

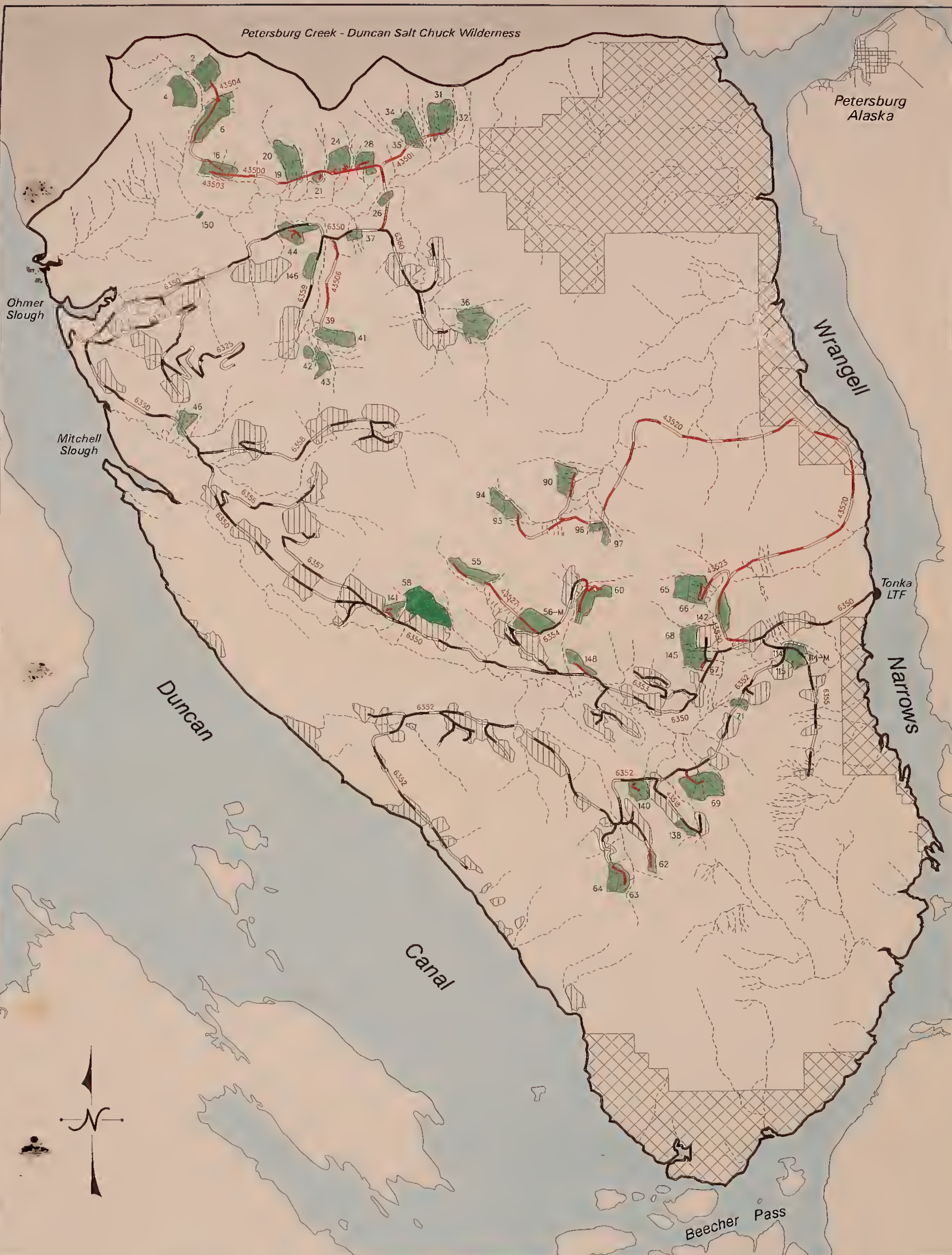


Figure 2-4. Alternative 4 - Proposed Harvest Units and Roads, South Lindenberg Timber Sale

LEGEND

- Study Area Boundary
- Existing Roads
- Proposed Roads
- Streams (Class I - III)
- Proposed Units
- Proposed Group Selection Units
- Existing Managed Stands
- Non-National Forest

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

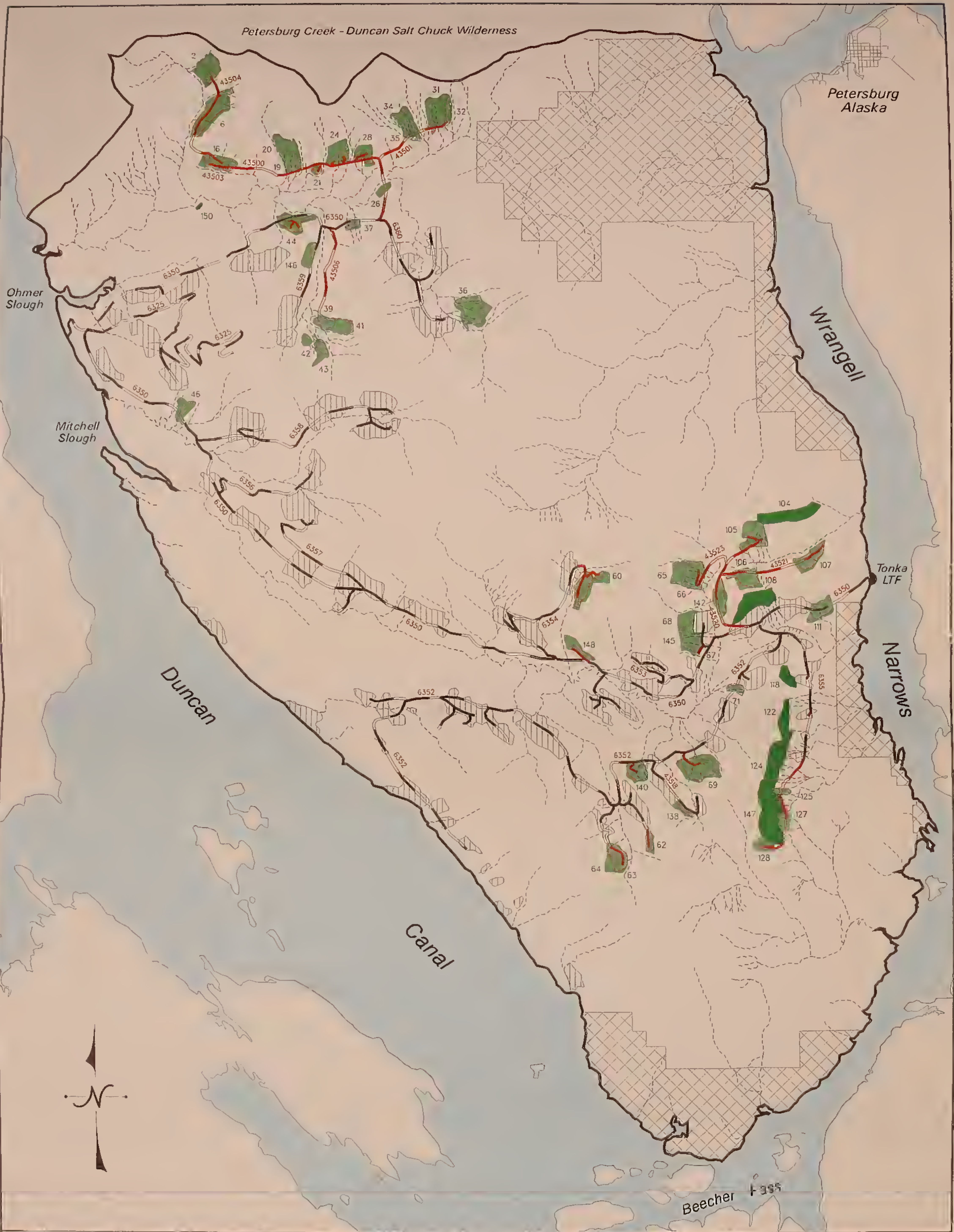


Figure 2-5. Alternative 5 - Proposed Harvest Units and Roads, South Lindenberg Timber Sale

LEGEND

- Study Area Boundary
- Existing Roads
- Proposed Roads
- Streams (Class I - III)
- Proposed Units
- Proposed Group Selection Units
- Existing Managed Stands
- Non-National Forest

SCALE 1 : 82,000

0 1 2 3 Kilometers

0 1 2 3 Miles

Chapter 3

Affected Environment

Chapter 3

Affected Environment

Introduction

This chapter describes the portions of the physical, biological, and social environment that may be affected by implementation of any of the alternatives. The description focuses on resource conditions for Forest Service lands on the Lindenberg Peninsula south of Petersburg Creek-Duncan Salt Chuck Wilderness. Some resource conditions consider a larger area if potential effects extend beyond the analysis area. This description of current conditions provides the basis for assessing the environmental effects of alternatives discussed in Chapter 4.

Climate

Temperature and Precipitation

The South Lindenberg area has a mild maritime climate that is moderated by the proximity of the Pacific Ocean, allowing the area to remain cool and moist year-round. The climate for the study area is best reflected by data recorded at the Petersburg weather station which is located just a few miles from the northwestern portion of the South Lindenberg area. January is normally the coldest month with an average minimum monthly temperature of 21°F (Figure 3-1). July is the warmest month (64°F average maximum).

Petersburg receives an average annual precipitation of 104 inches. Autumn is the wettest season, with monthly precipitation normally exceeding 10 inches from September through December (Figure 3-2). Even in the drier period of late spring and early summer, more than 5 inches of rain per month is normal.

The high annual precipitation of Southeast Alaska, combined with the relatively mild temperatures results in dense temperate rainforests and extensive boggy areas known regionally as muskeg. The South Lindenberg area includes more than 33,000 acres of temperate rainforest and over 16,000 acres of muskeg or mixed forest-muskeg wetland.

Figure 3-1
Average Monthly Temperatures at Petersburg

Snow Cover

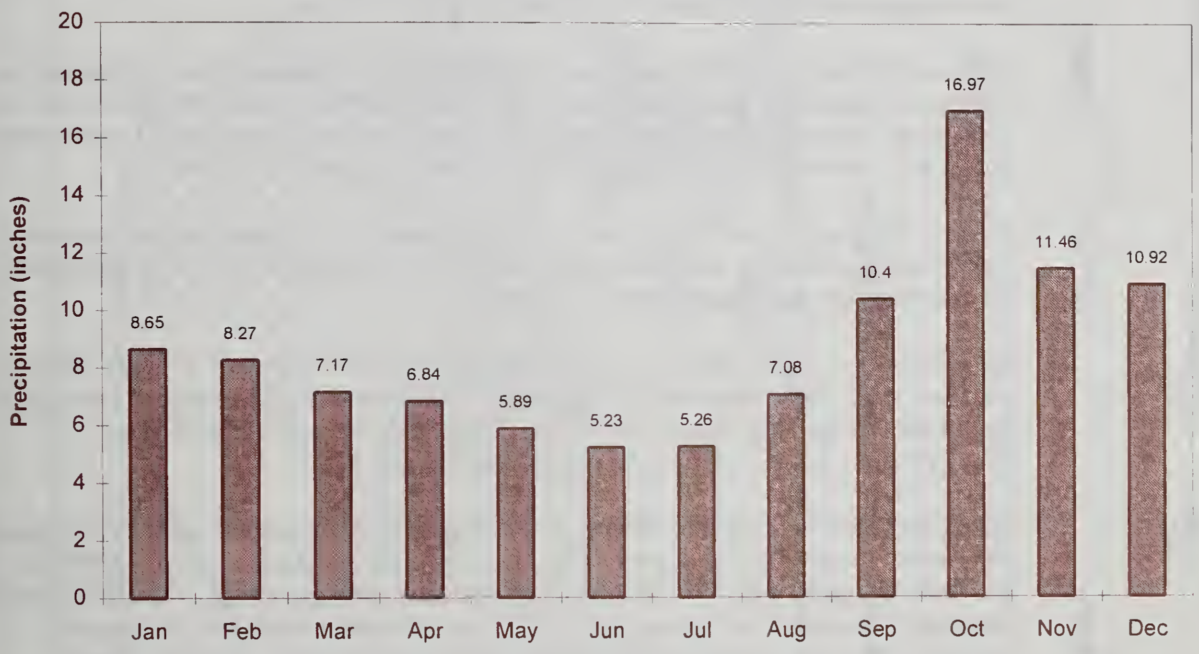
Depth and duration of snow cover varies with elevation, aspect, and forest canopy cover. Petersburg typically gets trace snowfalls beginning in October, with greatest snowfall occurring from December through February (NOAA, 1989–1993). There is usually some snow accumulation on the ground for varying periods from October through March, sometimes extending into April. In the 5 year period from 1989 to 1993, the greatest accumulation of snow on the ground totaled 51 inches in January 1993.

Wind

The strongest winds in Southeast Alaska typically occur in the fall and winter months (Harris, 1989). They generally blow out of the south or southeast, although wind direction in a specific location varies to some degree with the local topography. There are little detailed wind data available for Southeast Alaska. Storm winds in excess of 100 mph occur in the area.

Windthrow or wind damage is the principal natural disturbing agent in the Southeast Alaska forest ecosystem. High winds cause considerable damage, uprooting trees or breaking stems and create openings in the landscape. Created openings in the landscape also make adjacent timber stands more susceptible to windthrow. Sitka spruce is a commercially important

Figure 3-2
Average Monthly Precipitation at Petersburg



species in old-growth stands that is less shade-tolerant than western hemlock and is able to thrive in openings created by windthrow (Harris, 1989). Windthrow can also have beneficial impacts on wildlife and fish habitat.

On the other hand, windthrow is the major natural event in the formation of new timber stands. Openings in the forest canopy provide for increased light and growing space, allowing new trees to become established and grow more rapidly.

Air Quality

The cool temperatures and frequent rains typical of Southeast Alaska help to cleanse the atmosphere and contribute to the general high air quality of the area. The South Lindenberg area is governed by standards set forth by the Alaska Department of Environmental Quality (ADEC) and consist of particulate standards of 60 $\mu g/m^3$ (annual) and ambient 150 ug/m^3 (24-hr). Additionally, the region is classified as a Class II area which establishes a particulate matter increment for allowable increases above baseline levels. The increments for particulate matter in a Class II area are an annual geometric mean of 19 ug/m^3 or a 24-hour average of 27 $\mu g/m^3$.

Geology

Geologic processes are responsible for the current landforms of the South Lindenberg area. The resulting topography modifies the effects of climate on plant and animal communities.

Glacial deposits form most parent material for soils. Some bedrock units may contain valuable mineral deposits.

Geologic Setting

Lindenberg Peninsula of Kupreanof Island lies in the Alexander Archipelago of Southeast Alaska. This is a coastal group of mountainous islands lying west of the mainland coast range. The area has been subjected to isostatic and tectonic uplift as well as glacial and other climatic weathering processes. Land masses within the area are presently rising at a rate of approximately 0.5 centimeters a year.

Kupreanof Island is part of a geologically complex zone of tectonic terrains juxtaposed by transform faulting and concurrent or subsequent metamorphism, plutonism, volcanism, and glaciation. The surficial geology of the South Lindenberg area is dominated by Holocene and/or Pleistocene alluvial, colluvial, and glacial deposits (Brew et al., 1984).

Plutonic rocks are located throughout the study area and are composed of biotite-epidote-hornblende granodiorite, and quartz monzodiorite. These rocks are part of the informally named Admiralty-Revillagigedo Plutonic Belt.

The other major group of geologic rock units identified within the study area are Mesozoic phyllites, slates, and greenschists of the Duncan Canal-Zarembo Island-Screen Island Sub-belt of the Gravina Belt (Brew et al., 1979). These rocks are part of the Duncan Canal/Zarembo Island mineral resource tract (Brew et al., 1991).

Topography

Heavy glaciation has strongly influenced the topography and geomorphology of Lindenberg Peninsula. The area was once covered by Pleistocene ice to a depth of about 3,000 feet. A few mountain peaks over 3,000 feet high apparently escaped glaciation. The area is typified by strongly U-shaped valleys, steep walled cirques, scoured uplands and till covered lowlands. The area has risen several hundred feet since glaciation. Five low passes dissecting the area were probably under saltwater at one time, dividing the area into five smaller islands.

Minerals

There are approximately 42 active mining claims within the South Lindenberg area according to the records of the U.S. Bureau of Land Management (USBLM) and the U.S. Bureau of Mines (USBOM) (Fredricksen, 1996). Most of these claims are in the southern portion of the study area (Figure 3-3).

Review of mineral assessment information, local geology, known mineral occurrences, and mining claims records indicate that no specific areas of high value/high development potential, locatable mineral deposits (gold, copper, lead, etc.) have been identified. There is no current USBLM information indicating that the area contains valuable leasable mineral occurrences such as oil, gas, oil shale, potassium, and sodium-bearing minerals, and coal. USBLM data do indicate that the subject lands are prospectively valuable for geothermal resources.

The Duncan Canal/Zarembo Island Tract stretches for approximately 18 miles along the Duncan Canal fault zone and encompasses an area of 250 square miles. Approximately 16 square miles of Forest Service land in the western portion of the South Lindenberg area lie within the Duncan Canal/Zarembo Island Tract (Figure 3-3). However, no known locatable, leasable, or salable mineral occurrences are reported within the portion of the tract that lies within the study area. Sections of the Duncan Canal/Zarembo Island tract

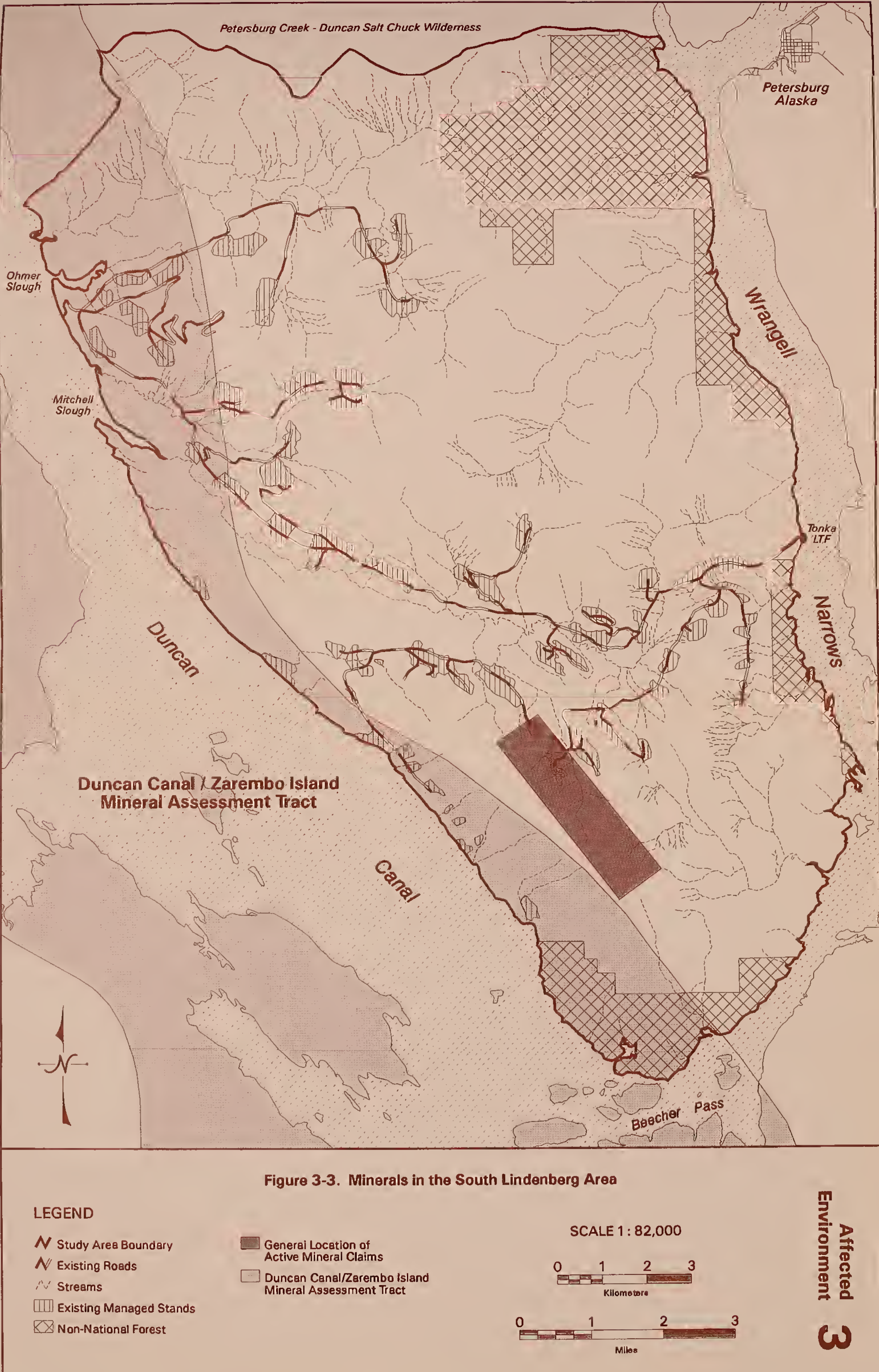


Figure 3-3. Minerals in the South Lindenberg Area

(Brew et al., 1991) to the north and south of the South Lindenberg area are described as the Zarembo high development potential mineral activity tract in the Draft Forest Plan Revision (USDA Forest Service, 1991a).

Common minerals such as sand and gravel are locally available within the study area. Deposits include active alluvial (water deposited) sands and gravels, alluvial benches and terraces, glacial deposits, and colluvium (rock debris deposited by gravity). These materials and rock quarries may be locally valuable as road-building material.

Soils

Along with topography and climate, soil condition is a primary factor determining timber production in Southeast Alaska. Most soils are almost continually saturated and thus vulnerable to landslides and erosion when present on steep slopes. Delivery of eroded soils to streams is a major concern for maintaining high quality habitat for fish.

Soil Characteristics

The general characteristics of soils in the area include strong acidity, extreme friability, low natural fertility, extremely rapid infiltration rates, rapid permeability in their upper layers, perpetual moistness, and a thixotropic nature (i.e., becoming liquid during rapid downslope movement). All soils have a thick organic mat ranging from a few inches to over a foot in depth.

Parent soil material consists mostly of glacial till derived from a variety of bedrock materials. The moist, humid climate and coniferous vegetation have resulted in the formation of acid spodosol soils which are very high in colloidals, humus, and iron. Valley bottoms are dominated by soils derived from alluvial and glacial deposits. Muskegs (bogs) are common due to restricted drainage. Well-drained productive timber soils occur on alluvial terraces and uplifted glacial gravel beaches. The gentle sloping valley bottoms and lowlands are dominated by somewhat poorly to poorly-drained soils. Shallow mineral soils are usually underlain by compact till, marine clays, or occasionally, bedrock. If disturbed, lowland soils can be very susceptible to surface erosion when exposed to flowing water.

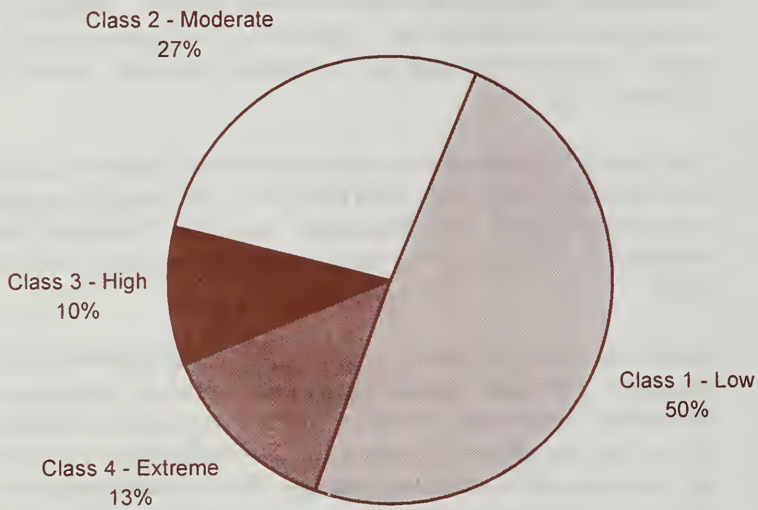
Mid-slope soils are formed primarily on colluvial deposits, and drainage is normally somewhat better than in valley bottoms. The upper slopes are very steep, and in many cases numerous V-shaped drainages are incised through fine textured soils near the lower portions of the slopes. Above 1,500 feet, imperfectly drained mineral and alpine organic soils are typically very shallow to bedrock. These soils and the muskegs of the lowland have a very high moisture retention capacity and remain wet most of the time. Soils on steep slopes are most susceptible to erosion and displacement in the form of landslides, debris avalanches, and deeply incised V-notch channels.

Hazards

The dominant erosional process for this area is mass movement, primarily in the form of landslides. Most landslides occur during or immediately after periods of high precipitation when the soil is saturated. Particularly susceptible are steep slopes containing other soil hazards (e.g., V-notch channels and windthrow, which can destabilize slopes and initiate landslides); soils with distinct slip planes, such as compacted till; or bedrock sloping parallel to the inclined surface.

Most undisturbed soils in the South Lindenberg area are resistant to surface erosion. Thick layers of surface organic material and thick vegetative cover protects the soil from surface erosion. Vegetation, particularly tree roots, have a stabilizing effect on soils and slope stability. The strength of tree roots tend to decrease significantly four to seven years after the tree is cut. This decrease in soil holding capability results in an increased likelihood of soil movement on steep slopes following clearcutting (USDA Forest Service, 1991g; 1992a).

Figure 3-4
Percent Distribution of Soil Hazard Classes in the South Lindenberg Area



Source: Stikine Area, GIS Database, non-federal lands excluded

The Forest Service uses soil hazard classes to describe the relative risk of excessive soil erosion from timber harvest. GIS data such as soil type and slope are analyzed to determine general stability of soils. Four soil classes (low, moderate, high, and extreme) are used to rank soil units according to their relative potential for mass movement. More than 75 percent of the South Lindenberg area is rated with low to moderate soil hazard classes (Figure 3-4). Most of these areas are associated with moderate slopes and lowland features such as streams and valleys (Figure 3-5). Less than one-fourth of the area is classified as having high to extreme soil hazards, which occur primarily on steeper slopes.

Watersheds

The watersheds within the South Lindenberg area are similar to other watersheds in central Southeast Alaska. While some stream segments are inherently unstable, there is no evidence of excessive surface or stream erosion. The South Lindenberg area is dominated by six large watersheds: Colorado Creek, Coho Creek, Skogs Creek, Duncan Creek, Mitchell Creek, and one large unnamed creek (Figure 3-6). Collectively, these watersheds drain 69.7 square miles. Additionally, 14 smaller watersheds located along the east and west sides of the peninsula comprise 2 square miles. The proposed action potentially involves activities in 11 watersheds. The Coho Creek watershed would be unaffected.

Steep slopes are susceptible to landslides throughout Southeast Alaska

Timber Management and Roads

Timber harvest and associated road networks have been linked to changes in the quality, quantity, and timing of streamflow; increases in sediment production; and the increased likelihood of mass soil movements (Chamberlin et al., 1991). Timber management activities have occurred within the South Lindenberg study area since the 1930s. Skogs, Colorado, Unnamed 5, and Unnamed 6 watersheds have not experienced previous harvest.

Previous timber harvest within the remaining South Lindenberg watersheds ranges from approximately 14 acres to 1,470 acres per watershed (Table 3-1). The percentage of harvest acres in these watersheds ranges from 1.6 percent to 20.4 percent of total watershed area. Increases in peak stream flows typically do not occur until about 20 to 25 percent of a watershed is logged (Harr, 1980). Other research suggests 35 percent can be harvested before base flows increase (Bartos, 1989). Only Unnamed 5 is approaching these thresholds of watershed sensitivity.

The current transportation system within the assessment area consists of 46.5 miles of existing road. Road miles within each of the roaded watersheds ranges from 0.6 miles to

26.5 miles (Table 3-1). Road densities and acreages are well below thresholds for watershed sensitivity (Harr et al., 1975).

Mass Soil Movement

Various mass soil movement or slope instability sites have been identified in the vicinity of proposed activities within the analysis area (Figure 3-6). The most commonly identified features include landslides, shallow slumps, V-notch failures, and channel bank failures. Mitchell watershed contains the largest number of identified mass movement sites, with 11 encountered during recent field examinations. In comparison, the watershed with the second highest number is Unnamed 1 with only three mapped soil movement or slope instability sites.

Streamflow

There are no streamflow gages in the South Lindenberg area. The local precipitation pattern results in near saturation of area soils and large, sudden fluctuations in stream discharge. The majority of the discharge occurs from October to February. Although discharge is clearly correlated to precipitation, average monthly streamflow discharge is not exactly parallel to monthly precipitation, particularly in summer when soils are not always saturated. October has the greatest average monthly discharge, whereas July and August have the lowest average monthly discharges.

Table 3-1
Drainage Area and Timber Management in Major South Lindenberg Watersheds

Watershed Name	Drainage (acres)	Managed Stands (acres)	Managed Stands (% of area)	Existing Specified Roads (mi)	Existing Specified Roads (mi/sq.mi)
Mitchell	13,645	1,470	10.8	26.5	1.2
Duncan	13,094	435	3.3	6.7	0.3
Skogs	5,192	0	0.0	0.0	.0
Unnamed 1	4,977	581	11.7	9.6	1.2
Colorado	3,542	0	0.0	0.0	0.0
Unnamed 7	1,142	0	0.0	0.0	0.0
Unnamed 6	936	0	0.0	0.0	0.0
Unnamed 2	875	14	1.6	0.2	0.1
Unnamed 5	871	178	20.4	3.0	2.1
Unnamed 3	363	23	6.3	0.6	1.0
Unnamed 4	174	3.3	1.9	0.2	0.7

Many of the large flooding events occur during the wettest months when warm air masses associated with rain storms melt snowpacks, resulting in additional water entering streams. These phenomena are called rain-on-snow events and frequently occur in areas that have transient snowpacks, generally between the elevations of 1,000 ft and 3,000 ft mean sea level (msl) elevation (Harr et al., 1989). The amount of additional water entering streams depends on the amount of rainfall, air temperature, wind speed, and the amount of water stored in the snowpack. As these variables increase, the amount of additional water entering streams increases.

The average annual discharge rates for watersheds within the South Lindenberg area range from 10 cubic feet per second (cfs) to 215 cfs for basins ranging in area from less than 1 square mile to over 20 square miles (Table 3-2). Estimated discharges resulting from 2-year storm event (i.e., bankfull flows) range from 190 cfs to 4,541 cfs. Estimated discharges resulting from a 100-year storm event for the ten major watersheds range from 347 to 10,990 cfs.

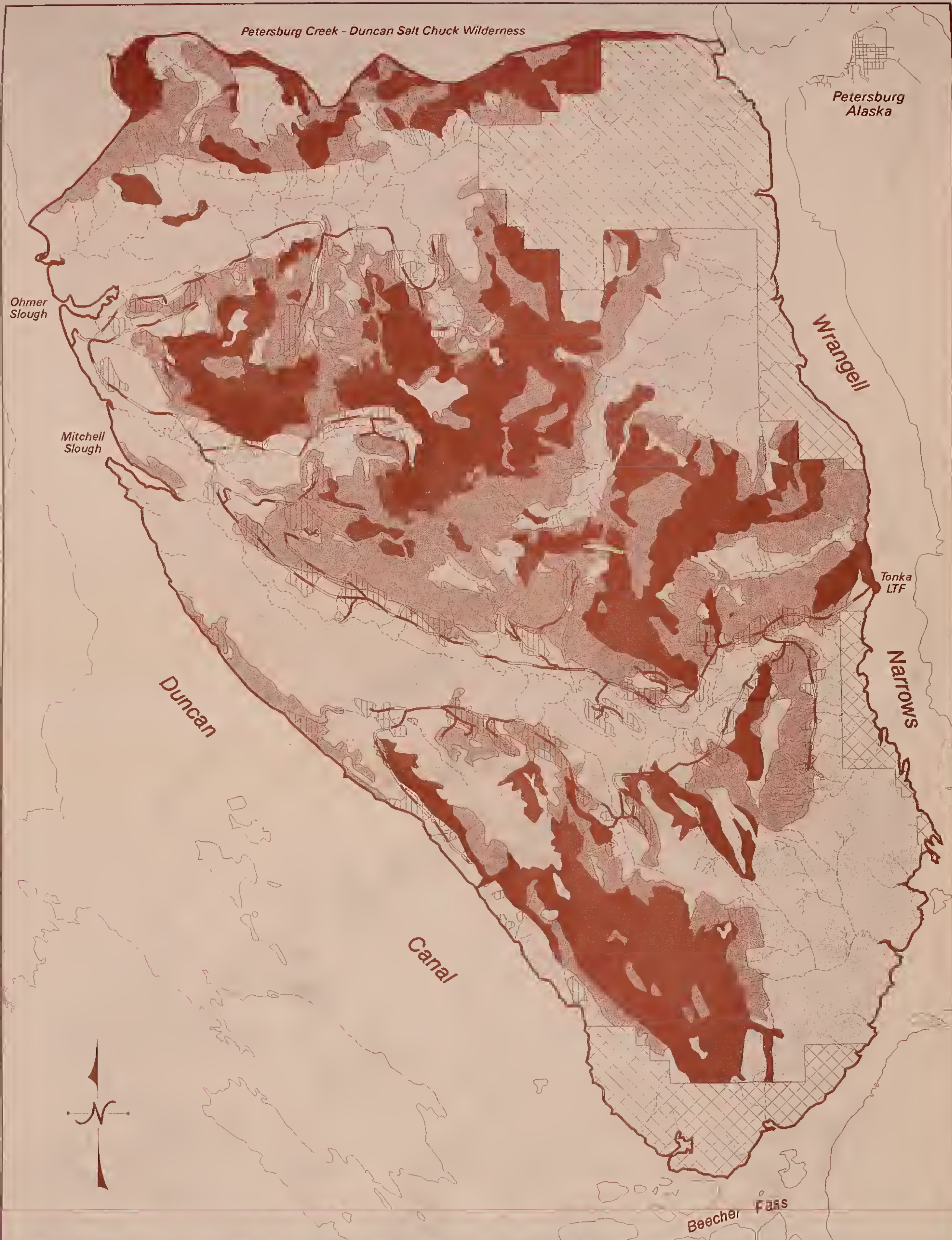


Figure 3-5. Inventoried Soil Hazard Classes in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- Soil Hazard I - Low
- Soil Hazard II - Moderate
- Soil Hazard III - High
- Soil Hazard IV - Extreme

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Figure 3-6. Watersheds and Observed Mass Wasting in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Watershed Boundary
- Existing Managed Stands
- Non-National Forest
- Mass Wasting/Erosion Sites
- Class I Streams
- Class II Streams
- Class III Streams
- Stream Study Reaches
- Fish Passage Barrier

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Collecting stream data in Duncan Creek

Table 3-2
Modeled Stream Discharges (cfs) and Measured Channel Stability in Selected South Lindenberg Watersheds

Watershed Name	Area (sq mi)	Average Annual Discharge	Peak 2-Year Discharge	Peak 100-Year Discharge	Average Stability Rating*
Mitchell	21.3	206	4,339	10,458	90
Duncan	20.5	215	4,542	10,990	71
Skogs	8.1	106	2,214	5,023	75
Unnamed 1	7.8	103	2,143	4,848	80
Colorado	5.5	72	1,484	3,248	82
Unnamed 7	1.8	29	590	1,189	79
Unnamed 6	1.5	25	505	1,004	---
Unnamed 2	1.4	20	412	802	---
Unnamed 5	1.4	19	389	755	73
Unnamed 3	0.6	10	191	347	---
Unnamed 4	0.7	10	207	380	---

* Stream Reach Stability Evaluation Rating
good = 39-76; fair = 77-114

Channel Stability

There are very few visual indicators of channel instability within the South Lindenberg area. Excessive bank erosion or large numbers of downed trees affecting channel movement are locally important but do not dominate any watershed. Stream channels generally consist of a single channel with only localized areas of channel braiding. Channel migration is present in alluvial fan areas where tributaries enter the main channel valley.

There are many indications of sediment transport. Within most channels there are large clean gravel and cobble deposits that indicate recent bedload movement. High flow bank erosion is occurring within the South Lindenberg area, but erosion rates do not appear any higher than would be expected in undisturbed watersheds. There was no evidence of sediment aggradation, which would indicate that sediment input rates exceed stream transport rates.

Channel stability evaluations using the methods of Pfankuch (1978) indicate that the streams within the major South Lindenberg watersheds have good to fair stability. Stability ratings averaged 78.4 and ranged from 71 to 90 (Table 3-2). These ratings are considered typical for streams in Southeast Alaska. They have a good ability to adjust and recover from changes in flow or increases in sediment production.

Water Quality

Isolated water quality measurements collected in late June and early July suggest that most areas are within suitability criteria for salmonids and meet the requirements for state water quality guidelines. Two sites on Mitchell Creek exceeded the state water temperature criteria of 15°C for rearing trout and salmon (Olson, 1995). Four other sites had temperatures in excess of 14°C. These measurements all occurred during a period of exceptionally low flows and sunny weather, and they do not indicate chronic temperature problems. However, they do suggest that these streams may be temperature sensitive. Measurements with continuously recorded thermographs never exceeded guidelines for mean or maximum temperatures. Currently, there are not enough data for the South Lindenberg area to discern whether temperature sensitivity (from spot measurements) or differences among basins (continuous data) are related to past timber harvesting activities.

Timber

Nearly all Forest Service land in the South Lindenberg area is either commercial or non-commercial forest (Table 3-3, Figure 3-7). Forested land is considered to be at least 10 percent occupied by forest trees of any table size, or formerly having had such tree cover, and currently not developed for non-forest use (USDA Forest Service, 1991b).

Table 3-3
Land Classification Acreages in the South Lindenberg Area

VCU	Non-Forested	Non-Commercial Forest	Commercial Forest	Total
437	378	9,464	13,840	23,683
439	341	6,188	7,727	14,256
447	617	9,175	7,896	17,687
448	149	1,101	1,469	2,718
Total	1,485	25,928	30,932	58,344

Source: Stikine Area GIS Database, TIMTYPE data layer (MB&G Update 7/95)

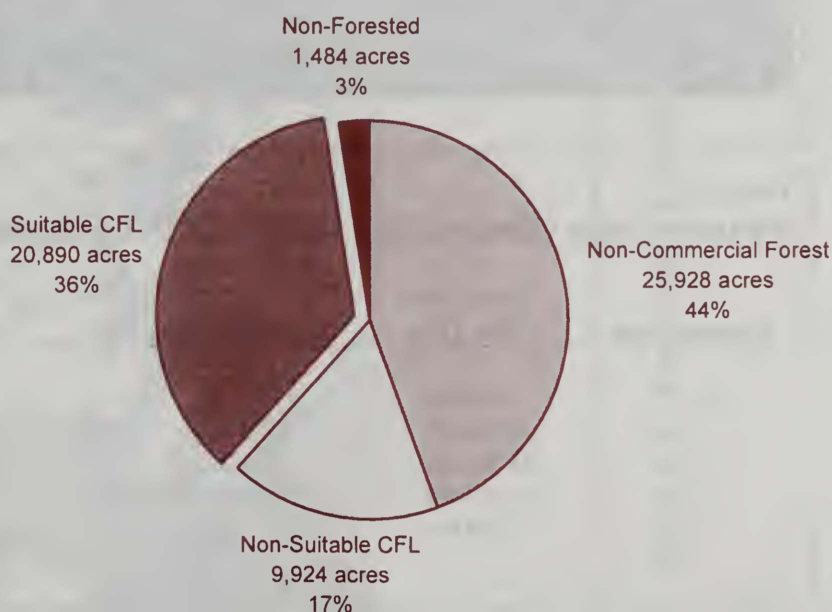
Commercial forest land (CFL) comprises 54 percent of the total forested area. To be considered commercial forest land, an area must be capable of producing industrial wood and have a site index of 40 or more or capable of producing 20 cubic feet/acre/year. CFL suitable for timber production covers 20,952 acres (Figure 3-8) and excludes:

- areas with extreme potential for slope failure and excessive erosion,
- areas that cannot be restocked with trees within 5 years given existing technology and knowledge; and
- areas withdrawn by legislative or administrative action including approximately 3,000 acres within TTRA stream buffers.

Volume and Size Classes

CFL in the Tongass National Forest is classified into discrete volume classes, each representing a range of timber volumes per acre. Volume Class 1 includes nonstocked lands that have been recently logged or disturbed by windthrow. Seedling/sapling stands comprise Volume Class 2. Volume Class 3 stands are pole sized stands with less than 8 MBF per acre. Volumes Class 4, 5, 6 and 7 stands contain trees of merchantable sized timber with more than 8 MBF per acre.

Figure 3-7
Forest Service Land Base in the South Lindenberg Area



Volume Classes 4-7 acres have volumes per acre and trees of merchantable size sufficient for a commercial harvest. Volume Classes 4 through 6 comprise approximately 85 percent of the total CFL in the South Lindenberg area (Table 3-4) and are the stands that are currently suitable for timber harvest. Volume Class 7 does not occur in the area. Although suitable for timber management, Volume Classes 1 through 3 do not have volumes and merchantable sized trees sufficient for a commercial harvest at this time. These stands generally include those areas that have been harvested and currently support second-growth trees in the smaller size classes.

Suitable forest land is only about one-third of the Lindenberg Peninsula

Table 3-4
Volume Class Composition in the South Lindenberg Area

Volume Class	Board Feet Per Acre	Commercial CFL Acres	(%)	Suitable CFL Acres	(%)
1-3	0-8,000	4,259	(14)	3,245	(15)
4	8-20,000	13,570	(44)	8,605	(41)
5	20-30,000	11,606	(38)	7,873	(38)
6	30-50,000	1,497	(5)	1,229	(6)
7	50,000+	0	(0)	0	(0)
Total		30,932	(100)	20,952	(100)

Source: Stikine Area Database (Updated 7/95 by Mason, Bruce, and Girard)

Timber size classes in Southeast Alaska are generally related to timber stand development. Size classes are divided into four categories: seedling and sapling (Size Class 1), pole timber (2), young growth sawtimber (3), and old growth sawtimber (4). Old growth stands (Size Class 4) dominate the South Lindenberg area, comprising at least 85 percent of both

Figure 3-8. Inventoried Suitable Commercial Forest Land in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest

GIS Inventoried Tentatively Suitable CFL

- Volume Class 3
- Volume Class 4
- Volume Class 5
- Volume Class 6

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

total and suitable CFL (Table 3-5). Size Classes 1 and 2 in managed stands comprise the remainder. Stands in areas that were harvested more than 50 years ago should be approaching Size Class 3 status.

Old Growth Stands

Most of the South Lindenberg area has not been previously harvested or disturbed for centuries. Forests in this mature and over-mature condition are considered "old growth forests" (Harris and Farr, 1974). The definition of "old growth forests" includes attributes other than age and size. They are characterized by stands in the latter stages of stand development and typically differ from earlier stages in tree size, amount of downed woody material, numbers of dead trees or snags, number of canopy layers, species composition, and ecosystem function (USDA Forest Service, 1991b). For purposes of this analysis, "old growth forest" is considered to be timber stands where the majority of volume is in trees greater than 9 inches at diameter breast height (DBH) and over 150 years old (Stand Size Class 4).

Table 3-5
Stand Size Class Composition in the South Lindenberg Area

Size Class	Description	Commercial CFL Acres	(%)	Suitable CFL Acres	(%)
1	0"to 4.9" DBH	4,146	(13)	3,185	(15)
2	5"to 8.9" DBH	114	(<1)	61	(<1)
3	9"+DBH &<150 Yrs Old	0	(0)	0	(0)
4	9"+DBH &>150 Yrs Old	26,673	(86)	17,706	(85)
Total		30,932	(100)	20,952	(100)

The Draft Forest Plan Revision (USDA Forest Service 1991b) describes old growth as typically distinguishable from younger growth by several of the following attributes:

- large trees for species and site,
- wide variation in tree sizes and spacing,
- higher accumulations of large-size dead standing and fallen trees compared to earlier stages,
- decadence in the form of broken or deformed tops or bole and root decay,
- multiple canopy layers, and
- canopy gaps and understory patchiness.

The mature and over-mature stands within the South Lindenberg area contain trees of many ages, sizes, and conditions. Snags and dead top trees comprise a significant part of the stands. Stands created by disturbance such as fire, landslide, windthrow, or logging are considered even-aged and contain trees relatively uniform in size. Timber harvesting has accounted for a small proportion of disturbance within the South Lindenberg area. Windthrow is the most common form of disturbance, as fire-caused disturbance is virtually nonexistent in this study area. The amount of snags and defect are generally less in these stands than in mature and over-mature stands. Over time, even-aged stands convert to

total and suitable CFL (Table 3-5). Size Classes 1 and 2 in managed stands comprise the remainder. Stands in areas that were harvested more than 50 years ago should be approaching Size Class 3 status.

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uneven-aged stands as insects, disease, wind, snow, and ice weaken and kill trees. This process creates openings in the forest canopy, allowing new vegetation growth to occur.

Old growth timber stands provide a wide variety in product quality. Due to the age of timber in mature and over-mature stands, much of the timber is of declining commercial quality and is only suitable for pulp. Although there is a high proportion of defective timber, old growth stands also contain large diameter trees that provide a source for high quality hemlock and Sitka spruce sawlogs.

Second Growth Stands

Even-aged, second-growth stands are characteristic of Size Classes 1 through 3. These size classes include seedling/sapling, pole timber, and small sawtimber less than 150 years in age. Past harvesting on the Lindenberg peninsula has converted approximately 4,700 acres (including both federal and non-federal lands) to early successional timber stands (Seaberg, 1996). These stands generally fit Size Class 1, with some stands in Size Class 2. Past records show harvesting occurred first in 1935 and then in the late 1950s and early 1960s, totalling approximately 200 acres (USDA Forest Service, 1976). These harvests were done adjacent to saltwater and were accomplished without the construction of major access roads. Most of the timber harvesting in the project area has occurred since 1980. The last harvesting occurred in May 1993 on the White Alice Timber Sale. These managed second-growth stands are anticipated to be certified as stocked in 1997 (in accordance with the National Forest Management Act).

Commercial Timber Species Distribution

The three major commercial tree species found in the South Lindenberg area are western hemlock (*Tsuga heterophylla*) Sitka spruce (*Picea sitchensis*), and Alaska-cedar (*Chamaecyparis nootkatensis*). Alaska-cedar is a high value species that is found throughout the study area but does not dominate forest stands. Mountain hemlock (*Tsuga mertensiana*) and western redcedar (*Thuja plicata*) are two minor commercial species also present in the area. Non-commercial species include shore pine (*Pinus contorta var. contorta*) and red alder (*Alnus rubra*). Species composition within the South Lindenberg area that is being considered for harvest consists of 68 percent western hemlock, 17 percent Sitka spruce, 9 percent Alaska-cedar, and 5 percent mountain hemlock. Product quality is variable, and a large portion of the available volume is suitable only for pulp wood. There are, however, areas with large-diameter trees, which provide a source for high quality hemlock, spruce, and Alaska-cedar sawlogs.

Understory Species

Dense understory vegetation is characteristic of forests in the South Lindenberg area. Common understory species include devil's club (*Oplopanax horridus*), early blueberry (*Vaccinium ovalifolium*), red huckleberry (*Vaccinium parvifolium*), Alaska blueberry (*Vaccinium alaskaense*), skunk cabbage (*Lysichitum americanum*), rusty menziesia (*Menziesia ferruginea*), salmonberry (*Rubus spectabilis*), western thimbleberry (*Rubus parviflorus*), and bunchberry (*Cornus canadensis*). *Vaccinium* species are common throughout the understory of most hemlock-spruce forests. Skunk cabbage and bog species indicate areas of poor drainage and usually low potential for tree growth. Alder and salmonberry are common in areas of recent disturbance such as road cuts, clearcuts, or landslides.

Forest Productivity

Site productivity is the inherent capability of a site to accumulate biomass. Drainage, soil depth, and elevation are the chief factors influencing productivity. The most productive sites include the high volume stands on the well-drained sites along streams and steep mountain slopes. The least productive sites include poorly drained areas and elevations over 1,500 feet msl.

Past forest inventories in Southeast Alaska (USDA Forest Service, 1991b) indicate that over-mature stands have reached an equilibrium in productivity, where annual growth is offset by mortality and net stand growth is zero. Establishment of new trees depends on the death of standing trees: openings provide growing space and sunlight to allow the regeneration of new trees. Potential harvest units examined by the interdisciplinary team (IDT) were judged to have reached the point of no net growth and were well past a point of highest average growth (culmination of mean annual increment). Forest inventory information for the entire Tongass National Forest continues to support the premise that growth equals mortality for the aggregate of old-growth stands (USDA Forest Service, 1991b).

Forest Health

Forest health relates to the resilience of a particular stand, watershed, or landscape to disease and damage. Standards to evaluate the health of a forest are related to the management objective for the forest. From the perspective of maximizing timber growth and minimizing yield losses, past timber harvesting has improved the health of the forests of the southern Lindenberg Peninsula. The regenerated stands are growing without the volume losses associated with decay fungi, dwarf mistletoe, and windthrow. Natural processes are continuing where decay, mistletoe, and windthrow contribute to the ecosystem's diversity and long-term stability by providing increased canopy diversity and animal habitat, and by causing the formation of small scale gaps (USDA Forest Service, 1991b).

Windthrow

Wind is the major disturbing influence shaping Southeast Alaska ecosystems. Windthrow events create the openings in which successive generations of trees, shrubs, and forbs reproduce. Evidence of windthrow is found almost universally in every South Lindenberg timber stand. Locations more susceptible than others include south aspects, saddles, and areas with high waters. Timber stands with dense stocking and tall trees are also more susceptible to windthrow, especially if the stand is opened up by harvest, landslide, or adjacent windthrow.

Each year wind causes considerable damage and loss of merchantable timber throughout Southeast Alaska. One study indicates that wind was responsible for approximately one-fourth of the annual tree mortality in Southeast Alaska during a seven year period (Hutchison and LeBau, 1975). Wind processes in combination with snow can cause top breakage, creating entrance points for decay fungi and ultimately causing merchantable volume loss.

Windthrow is found along the boundaries of most managed stands within the South Lindenberg area. Most of the windthrow occurs along the leeward edges of harvested blocks, especially for units with south aspects. Recently harvested units located on the north-facing slopes in the Duncan Creek valley appear to be less affected by windthrow.

Dwarf Mistletoe

The occurrence of dwarf mistletoe (*Arceuthobium campylopodum*) in mature and over-mature western hemlock stands is widespread throughout Southeast Alaska. This pathogen is prevalent in all areas of South Lindenberg considered for potential harvest and is considered significant in 37 proposed units. Dwarf mistletoe reduces the vigor and growth rate of trees and often produces a lower quality of timber (Ruth and Harris, 1979). Cankerous swellings often occur at the point of infection on limbs or main stems. These cankers offer an entrance for wood-destroying fungi, which can lead to heart rot.

The spread of dwarf-mistletoe in young hemlock stands possibly results from leaving infected hemlock standing in cutover areas (Shaw, 1982; Shaw and Hennon, 1991). Dwarf mistletoe responds to light with increased seed production. Rates of spread to adjacent and lower canopy trees may increase in partial cuts where an infected hemlock overstory remains.

Alaska-Cedar Decline

Alaska-cedar decline is a disease causing considerable mortality in Southeast Alaska. Mortality can be in small patches or can cover expansive areas. Affected trees may die quickly (over 2 or 3 years), or more slowly over a 15 year period or longer with crowns progressively thinning. The cause of Alaska-cedar decline is not completely understood but the disease is generally associated with boggy conditions usually near muskegs. The primary cause of mortality is unknown, and no single factor has been shown to be primarily responsible for tree death (Hennon et al., 1990).

Alaska-cedar decline is evident in eight of the proposed South Lindenberg harvest units (Seaberg, 1996). Areas of Alaska-cedar mortality were harvested in the White Alice Timber Sale between 1991 and 1993.

Decay Fungi

Decay caused by heart and root rotting fungi is probably the greatest single cause of disease-related volume loss in Alaska (Laurent, 1974) including the South Lindenberg area. Significant decay or associated physical defect occurs in 70 proposed harvest units. Decay-causing fungi in the study area include: *Fomes pinicola* (brown rot fungus of Sitka spruce and western hemlock); *Armillaria mellea* (white rot fungus of western hemlock); and *Heterobasidium annosus* (white rot fungus of western hemlock). Physical defects such as broken tops and frost cracks, which are common throughout the South Lindenberg area, provide points of entry for decay fungi.

In old growth stands, annual volume loss from decay fungi may equal or exceed volume growth. Approximately 31 percent of the gross board foot volume in old growth stands has been estimated to be unusable as sawtimber (Ruth and Harris, 1979). Based on Forest Service estimates for Kupreanof Island, the average defect for the South Lindenberg volume classes is approximately 40 percent.

Insect Defoliators

Defoliation by insects occurs in proposed harvest units facing the Wrangell Narrows opposite Papke's Landing. Forest Service pest surveys identify this area as being infested by black headed budworm (*Acleris gloverna*) and the hemlock sawfly (*Neodiprion tsugae*). Western hemlock is the principal timber species affected by these insects. Black headed budworm is one of the most destructive insects in Southeast Alaska. Larval feeding strips hemlock foliage and causes growth reduction, top-kill, and occasionally tree mortality.

The hemlock sawfly is a serious defoliator throughout Southeast Alaska that feeds on mature (older) growth rather than current year foliage. Most sawfly outbreaks do not cause tree mortality, but the tops are killed in some trees and tree growth may be reduced. Extensive mortality does not generally result because trees can usually survive up to two defoliations. Mild summers in 1992 and 1993 probably created conditions favorable for insect outbreak. The return to wetter conditions during the summer of 1994 probably reduced insect populations.

Wetlands

Approximately 24,000 acres of the South Lindenberg area are classified as wetland, comprising roughly 42 percent of the entire study area (Table 3-6).

Wetlands are distinguished by the presence of water, soils that are saturated for at least a portion of the growing season, and vegetation adapted to wet conditions. The frequent

occurrence of wetland hydrologic conditions across the South Lindenberg area is due to precipitation in the region exceeding evapotranspiration. Additionally, the lack of topographic relief in the valleys and lowland flats and the shallow depth to bedrock or compact glacial till impede drainage. The cool, moist conditions characteristic of Southeast Alaska inhibit decomposition rates, resulting in higher concentrations of organic materials in the soils. These organic soils hold more water than typical mineral soils and so contribute to slow drainage.

Wetlands in South Lindenberg were classified into six types: coniferous forest, muskeg, mixed forest-muskeg, subalpine, estuaries, and lakes and ponds. Most wetland area is mixed forest-muskeg wetland. Subalpine is the second-most abundant wetland type, followed closely by muskeg and coniferous forested wetlands. These primary wetland types are distributed throughout South Lindenberg (Figure 3-9). Wetlands characterized by other vegetation types are much smaller in area. Over 120 soil types have been mapped by the Forest Service for the Stikine Area of the Tongass National Forest (USDA Forest Service, 1991c). Twelve of these are classified as hydric soils (soils that are saturated long enough to have low levels of oxygen) occurring in the South Lindenberg study area. These soil types consist of organic soils and mineral soils with relatively high organic material content and are found throughout the South Lindenberg wetlands.

Most of the wetlands examined in the study area have saturated soils in mid-July, indicating that soil saturation is generally continuous throughout the growing season. Extensive ponding is common in the muskegs and other topographically flat sites, while soils saturated to the surface were common in most forested wetland areas.

Wetland Functions

Wetlands in general are recognized to provide certain functions: floodflow modulation, wildlife habitat, groundwater recharge, groundwater discharge, sediment retention, toxicant reduction, and sustaining streamflows during dry seasons. Not all wetlands provide all of these functions, and not all wetlands that perform the same function provide it at the same level. The wetland types identified in the South Lindenberg area most commonly provide: sediment retention, floodflow alteration, wildlife and fisheries habitat, and sensitive plant habitat.

Sediment retention is the removal of inorganic sediments from water. Wetlands are typically depositional landforms where sediment settles out of slow-moving water or is trapped and stabilized by vegetation. Sediment retention is an important water quality improvement function provided by wetlands, in that surface runoff often flows directly through wetlands into streams. Sediment in streams can degrade salmonid spawning habitat and adversely affect the ability of juvenile fish to thrive. The South Lindenberg area wetland types most important in sediment retention are 1) muskegs and mixed forest-muskeg wetlands that are located in stream valleys and near tributaries below sites prone to mass wasting or landslides; and 2) densely vegetated forested wetlands that occur near the foot of steeper slopes or in riparian zones. Muskegs are capable of capturing and holding sediments due to their frequent location in low-lying areas and the reduction in stream flow that occurs when water passes through vegetation. Forested wetlands in riparian zones are important in filtering sediment because they interact extensively with surface water from uplands and streamwater from upstream.

Table 3-6
Dominant Wetland Vegetation and Acreage

Wetland Vegetation Type	Typical Species	Wetland Acreage	Percentage of South Lindenberg
Mixed forest - Muskeg	Sitka spruce western hemlock shore pine bog cranberry Sitka sedge deer cabbage	13,016	22%
Coniferous Forest	Sitka spruce western hemlock fern-leaved goldthread oval-leaved blueberry bunchberry yellow skunk cabbage lady fern	2,977	5%
Muskeg	bog cranberry bog blueberry deer cabbage great burnet Sitka sedge round-leaved sundew	3,482	6%
Estuaries	seaside arrowgrass Alaskan plantain dunegrass Lyngbey's sedge silverweed	51	<1%
Subalpine	deer cabbage several-flowered sedge caltha-leaf avens Merten's mountain heather mountain marsh marigold mountain hemlock	4,653	8%
Lakes and Ponds	Sitka sedge Russet's cottongrass manna grass dwarf blueberry Labrador tea	39	<1%

Source: Harper, 1995

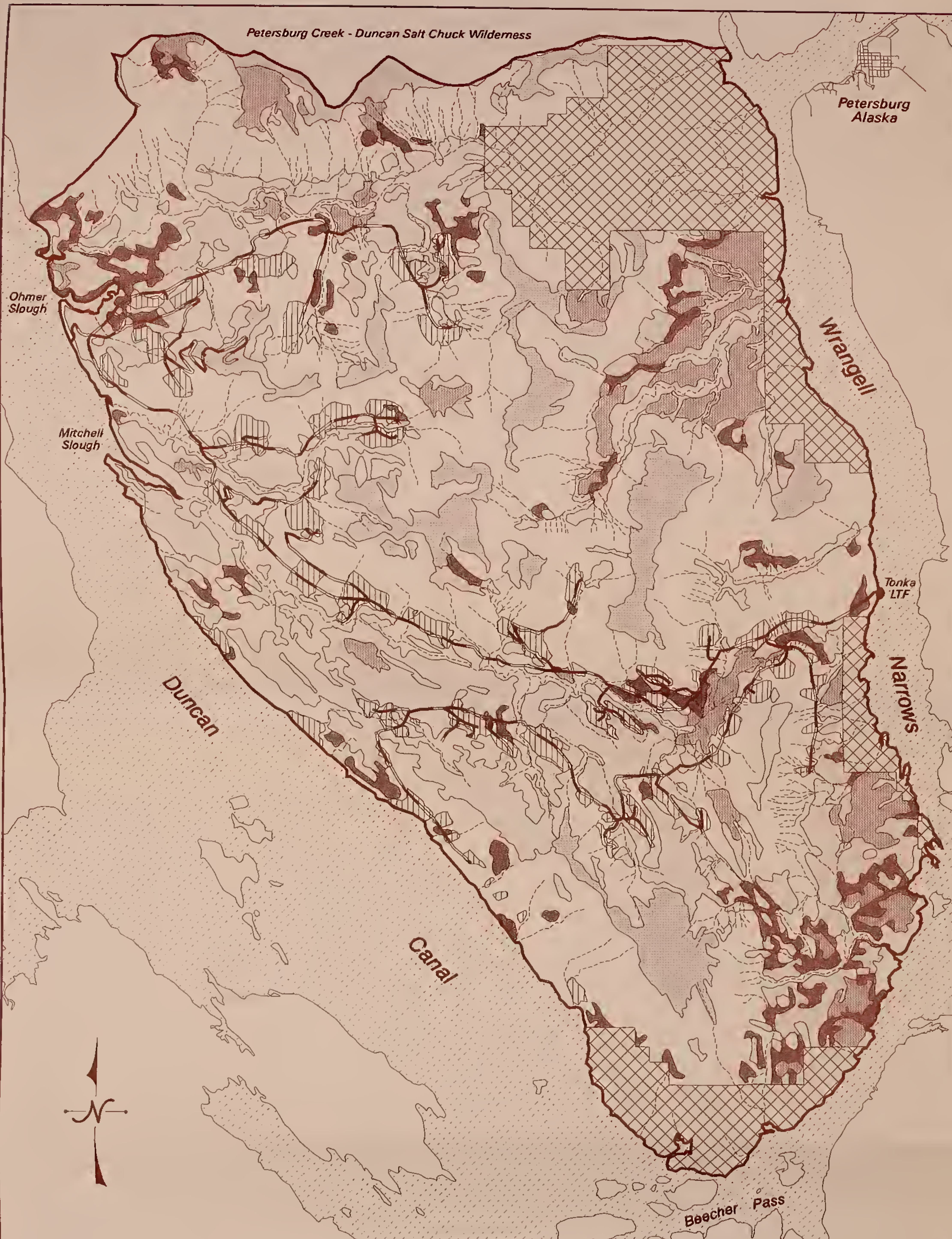


Figure 3-9. Inventoried Wetlands in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- Coniferous Forested Wetlands
- Mixed Forest-Muskeg
- Muskeg
- Subalpine Wetlands

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Floodflow modulation is the reduction in magnitude of peak stream flows and the delay in release of water to downslope areas immediately after storms. Both forested wetlands and muskegs in the South Lindenberg area serve important roles in modulating floodflows by intercepting and detaining surface runoff and direct precipitation that would otherwise flow directly into streams. This can alleviate downstream flooding and minimize stream channel erosion and sedimentation. Muskegs can effectively modulate floodflows because their vegetation slows the movement of water and they provide extensive flat areas conducive to storing large volumes of surface water. Forested wetlands are typically located adjacent to drainages and stream floodplains and are therefore more likely to come in contact with floodwaters. These wetlands provide surface water storage capacity and their dense vegetation can absorb water and effectively impede downslope movement of water.

Water lilies in bloom within a muskeg pond

Although there is not as sharp a distinction between wetland and non-wetland habitat in the moist maritime climate of Southeast Alaska as there is in more arid regions, some wetland types in the South Lindenberg area do have unique roles as wildlife habitat. The most significant wildlife habitat within wetlands on the South Lindenberg Peninsula occurs in muskegs, particularly those located adjacent to bodies of fresh water such as ponds, streams, or lakes. Open-canopy wetland areas that are interspersed with open water areas are important habitat for amphibians, waterfowl, shorebirds, river otters, beaver, and other small mammals. Estuaries are extremely valuable wetland areas in providing wildlife and fisheries habitat, but are uncommon in the South Lindenberg area. Floodplain wetlands that have connective channels to adjacent streams are important in serving as rearing and overwintering habitat for juvenile salmonid species.

Wetlands often support unique plant communities because of the unusual adaptations required to thrive in saturated soils. Muskegs and other types of bogs often have very low nutrient levels and unusually acidic conditions that act as additional stresses to which many wetland plants cannot adapt. Those species that do occur in muskegs and bogs have developed unique structures and metabolic pathways by which to obtain and process nutrients. Having evolved such specific adaptations for a particular habitat, such species are unable to thrive elsewhere and are restricted to a wetland type that is becoming rare in the

lower 48 states of the United States and elsewhere in the world. While muskegs are not considered rare in Alaska, ongoing development can result in impacts to sensitive plant populations unique to muskeg habitat. Choris' bog orchid occurs in muskegs within the South Lindenberg study area and is listed as sensitive by the Forest Service Alaska Region.

Wildlife

Differences in elevation, landform, and vegetative-cover produce a diversity of habitat types for wildlife species occurring in the South Lindenberg area. Terrestrial vegetation is predominantly coniferous forest, but areas of subalpine meadow and low-growing muskeg vegetation are dispersed throughout the landscape. The study area is surrounded on three sides by saltwater, but the island peninsula also includes several moderately-sized river systems, abundant small coastal watersheds, extensive wetland areas, lakes, and estuaries. The result of this habitat mosaic is the potential for a wide range of animals to occur in the region of the Lindenberg Peninsula.

Habitat

The occurrence of particular wildlife species in a region is dependent in part upon the presence of habitat suitable for at least some stage of their life-cycle activities (e.g., feeding, reproduction, or cover). Wildlife habitats in the South Lindenberg analysis area are of three broadly-defined types: aquatic, forested, and non-forested. Specific habitats within each of these generalized categories have been described by Taylor (1979), whose classification scheme is briefly summarized below.

Aquatic Habitat

Aquatic habitat found in the South Lindenberg analysis area includes marine waters, estuaries, streams (riverine habitat), lakes (lacustrine habitat), freshwater marsh or muskeg (palustrine habitat), and associated ecotones (edge habitat). The marine ecosystem includes the major waterways surrounding Lindenberg Peninsula (the Wrangell Narrows and Duncan Canal), small bays, estuaries, and shoreline. Estuaries are formed where freshwater streams enter the sea and include all areas of brackish waters that are influenced by tides. Estuaries occur at the mouths of Duncan and Mitchell creeks; several small bays also occur within the study area. Outside of the study area, the large estuary at the mouth of Castle Creek (westward across Duncan Canal), the tidal flats in Little Duncan Bay, McDonald Arm, and at the mouth of Petersburg Creek, and Blind Slough on Mitkof Island are significant aquatic habitats that are accessible to some mammalian species and within short flying-distance for birds using the South Lindenberg area. Marine waterways provide habitat for marine mammals, waterfowl, and seabirds. Estuarine waters typically teem with invertebrates and fish, and provide feeding grounds for some mammalian species, raptors (predatory birds), shorebirds, gulls, and waterfowl.

Freshwater aquatic habitats in the interior of the South Lindenberg area include two lakes and several stream systems. Streams provide food, water, and riparian habitat for mammals, birds, and amphibians, as well as habitats for fish and aquatic invertebrates. Lakes provide extensive areas of open water with adjacent freshwater marsh habitat. These types of areas typically serve as feeding, nesting, and rearing habitats for waterfowl, loons, grebes, herons, shorebirds, and raptors.

Ecotones (edge habitat) are transitional zones between distinct habitat types, such as aquatic habitats and surrounding terrestrial habitats. These can include riverine wetlands, beaver ponds, sedge meadows, and muskegs bordering aquatic or terrestrial areas. Edge habitats can be well-developed and distinct (e.g., a riparian corridor containing specific types of plants) or non-distinct (e.g., forested wetland mosaic abutting a lake). Many wildlife species, including a variety of birds and mammals, use edge habitats in the South Lindenberg area.

Forested Habitat

Forested areas represent the majority of wildlife habitat in the South Lindenberg area. Subsets of this habitat type in the South Lindenberg area include coastal western hemlock and Sitka spruce forest (Taylor, 1979). Old-growth forests have developed over the centuries in Southeast Alaska without widespread catastrophic disturbances such as wildfire (Suring et al., 1992a). These forests are characterized by large-diameter trees typically older than 150 years and often exceeding 300 years. Seedlings, saplings, and pole-sized trees grow in the scattered openings created when old trees die and fall to the forest floor. This cycle of growth, death, and regeneration creates broken multilayered canopies where standing snags and downed logs add to the structural complexity found in old-growth forest (Schoen et al., 1988). The forest floor is carpeted by an abundance of ferns, mosses, herbs, and shrubs (Alaback, 1982), with lichens and fungi adding to the ecological diversity in a matrix of dead and decaying organic matter and soil. Tongass National Forest in Southeast Alaska supports the largest contiguous tracts of old-growth remaining in the United States (Samson et al., 1991).

The structural and ecological complexity of old-growth forest is important for supporting a diversity of wildlife species. Many wildlife species make substantial use of these forests during their lives, and some species are dependent exclusively upon this habitat for some or all of their life-cycle needs (e.g., marten, cavity-nesting birds, and marbled murrelet).

Non-Forested Habitat

Most of the non-forested habitat within the South Lindenberg area consists of muskeg wetlands. Other non-forested habitats include shrub and subalpine habitat. Muskeg and subalpine habitats are typically dominated by low-growing shrubs, forbs, and graminoid (grass) species and often include clusters of stunted coniferous trees. These open areas p provide browse and forage for large mammals, food and dwelling habitat for burrowing small mammals, nesting and feeding habitat for ground-nesting birds, and hunting habitat for raptors. Small ponds in muskeg wetlands also provide resting and feeding areas for migrating waterfowl and breeding sites for amphibians.

Core Habitat Areas and Wildlife Corridors

Unfragmented core habitat areas are essential to the maintenance of ecological diversity. Based on the theory of island biogeography, a larger area typically has more species traveling into it or through it than does a smaller area (MacArthur and Wilson, 1967). In addition, the increased habitat heterogeneity typical of larger areas allows for greater retention of species once they arrive to an area (Wilcove et al., 1986). A Sitka spruce-western hemlock forest may appear to be a uniform landscape; however, it is really a mosaic of many microhabitats which differ according to successional stage, vegetative structure, aspect, elevation, whether upland or wetland, and many other factors. Each microhabitat in each season may provide resources to a different community of wildlife species. Some species are critically dependent upon certain microhabitats during particular stages of their lives (e.g., larval stage of frogs) or under particular conditions (e.g., during harsh winters). Sufficient stand size is a key element to maintaining a full complement of microhabitats, preserving interior forest dynamics, maintaining microclimates associated with old-growth stands, and ensuring long term survival of old-growth stands and associated wildlife species (Samson et al., 1991).

Wildlife corridors or landscape linkages are currently the most widely advocated method for countering the effects of habitat fragmentation (Noss and Harris, 1986). Species that do not readily disperse across altered habitats may depend on the presence of undisturbed corridors between habitat patches (Harris, 1984). Corridors function to link core areas, thereby creating a larger total area of available habitat. They increase the likelihood of dispersal of organisms between habitat patches when the patches are too small to support viable populations (Samson et al., 1991). Because old-growth stands are mosaics of

microhabitat, individual patches within a fragmented landscape may not have the full range of microhabitats that were originally present (Suring et al., 1992a). In this case, corridors are critical in maintaining linkages between patches that singularly may not fulfill microhabitat needs, but collectively meet species requirements. Ecotone or edge habitats along streams are commonly used as corridors by numerous wildlife species.

Species

The following sections provide an overview of wildlife species known to occur in Southeast Alaska, with specific accounts of species observed in the study area. A regional wildlife species inventory for Alaska developed by Taylor (1979) and a list of amphibian, avian, and mammalian species observed during wildlife surveys for this EIS are included in the wildlife resource report in the South Lindenberg EIS planning record (Percival et al., 1995). Some wildlife species occurring on or near Kupreanof Island are listed by the U.S. Fish and Wildlife Service as threatened or endangered, have recently been proposed or petitioned for listing, are candidates for listing, or are designated as sensitive species by the Forest Service. These particular species are addressed in a later section of this chapter.

Old-growth forest is important wildlife habitat in the South Lindenberg area

The following sections provide an overview of wildlife species known to occur in Southeast Alaska, with specific accounts of species observed in the study area. A regional wildlife species inventory for Alaska developed by Taylor (1979) and a list of amphibian, avian, and mammalian species observed during wildlife surveys for this EIS are included in the wildlife resource report in the South Lindenberg EIS planning record (Percival et al., 1995). Some wildlife species occurring on or near Kupreanof Island are listed by the U.S. Fish and Wildlife Service as threatened or endangered, have recently been proposed or petitioned for listing, are candidates for listing, or are designated as sensitive species by the Forest Service. These particular species are addressed in a later section of this chapter.

Reptiles and Amphibians

Six species of amphibians and two reptilian species are known to occur in Southeast Alaska. The only amphibians observed in the South Lindenberg area were rough-skinned newt (*Taricha granulosa granulosa*) and western toad (*Bufo boreas boreas*). No reptilian species

were seen nor are any specifically known by area resource professionals to occur in the study area. The population status of amphibian species in the South Lindenberg analysis area is not known.

Eight rough-skinned newts were observed at two beaver ponds, in a muskeg pond near proposed harvest units 39 and 42, and in the forest within proposed Harvest Unit 16. Adult western toads observed during aquatic surveys totaled 45, and many more were seen in the study area by wildlife biologists and other field personnel. Toads were observed at muskeg and lakeshore survey sites and incidentally along creeks, at a beaver pond within the forest, in young second-growth forest, and in a sedge meadow. Green Rocks Lake, where several thousand western toad tadpoles were observed, appears to be a particularly productive breeding site for toads.

Birds

There are 277 bird species known to occur in Southeast Alaska. Most are not likely to occur on the Lindenberg Peninsula because many species prefer habitats that are not well-represented in the study area, and only 43 species were directly observed during the summer field activities for this EIS. This brief survey period precluded observation of migrating species that visit the area in other seasons. Also, field efforts focused on the terrestrial forested habitats, whereas many regularly-occurring species are more closely-associated with aquatic habitats. Bird sightings were incidental in that formal surveys were not conducted for birds other than marbled murrelet (*Brachyramphus marmoratus*) and northern goshawk (*Accipiter gentilis*) (see TES Species). Because most proposed harvest units are in western hemlock-Sitka spruce forest, the observed bird community did not vary widely.

Forest bird species commonly heard and seen within the area were: blue grouse (*Dendrogapus obscurus*), chestnut-backed chickadee (*Parus rufescens*), red crossbill (*Loxia curvirostra*), Steller's jay (*Cyanocitta stelleri*), hermit thrush (*Hylocichla guttatus*), varied thrush (*Ixoreus naevius*), and winter wren (*Troglodytes troglodytes*). Passerine birds commonly found in forest-muskeg edges, muskeg habitats, and beaver pond marshes included Pacific-slope flycatcher (*Empidonax difficilis*), Lincoln's sparrow (*Melospiza lincolnii*), and dark-eyed junco (*Junco hyemalis*). Birds observed in shoreline areas were common loon (*Gavia immer*), pigeon guillemot (*Cephus columba*), marbled murrelet, white-winged scoter (*Melanitta fusca*), common merganser (*Mergus merganser*), mew gull (*Larus canus*), Bonaparte's gull (*Larus philadelphia*), bald eagle (*Haliaeetus leucocephalus*), belted kingfisher (*Ceryle alcyon*), and northwestern crow (*Corvus caurinus*).

Cavity-nesting birds in the study area include both those that excavate cavities and those that rely primarily on cavities excavated by other species. Red-breasted sapsucker (*Sphyrapicus ruber*), hairy woodpecker (*Picoides villosus*), and chestnut-backed chickadee are species in the South Lindenberg analysis area that excavate cavities themselves. Birds observed that are known to nest in cavities excavated by woodpeckers included northern pygmy owl (*Glaucidium gnoma*) (observed in proposed harvest units 55, 90, and 114), Pacific-slope flycatcher, and winter wren. In addition, Vaux's swifts (*Chaetura vauxi*) were observed near proposed Harvest Unit 42.

Sharp-shinned hawks (*Accipiter striatus*) were observed in proposed harvest units 6, 16, 21, 28, 67, 90, 98, 114, 119, and 146. Red-tailed hawks (*Buteo jamaicensis*) were observed in proposed harvest units 6, 42, 90, 97, 107, and 124. Most of these birds were observed when they responded (with defensive or wail calls of their own) to the broadcast of northern goshawk vocalizations (see TES Species). Surveys to locate nests of these species were not conducted in the study area, but one red-tailed hawk nest was discovered within proposed Harvest Unit 43.

Other notable bird sightings included great blue heron (*Ardea herodias*) nests with nestlings in proposed harvest units 4 and 6, and a few observations were made of greater yellowlegs (*Tringa melanoleuca*) nest-defense behaviors in muskeg habitats.

Mammals

Nearly one-third of the 77 mammalian species found in Southeast Alaska are marine mammals (whales, dolphins, porpoises, seals, and seal lions), and most are not likely to occur with any regularity in the South Lindenberg area. The remaining species that occur in the region are terrestrial mammals, including species from the following taxonomic orders: Chiroptera (bats), Insectivora (shrews), Rodentia (rodents), Carnivora (carnivores), and Artiodactyla (hoofed mammals). The specific distribution of most terrestrial mammalian species on Kupreanof Island and in the South Lindenberg area is largely unknown.

Direct sightings of black bear (*Ursus americanus*), river otter (*Lutra canadensis*), Alexander Archipelago wolf (*Canis lupus ligoni*), harbor seal (*Phoca vitulina*), red squirrel (*Tamiasciurus hudsonicus*), beaver (*Castor canadensis*), porcupine (*Erethizon dorsatum*), Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), harbor porpoise (*Phocoena phocoena*), and orcas (*Orcinus orca*) were made in the South Lindenberg area or in adjacent marine waters during summer 1994 field activities. Observations of mammal sign included: bear trails, foraging areas, and scat; moose tracks and scat; deer trails, bedding areas, and scat; beaver sign (felled trees and trails to water); and porcupine-chewed bark. Black bear sign and Sitka black-tailed deer sign were abundant near proposed units south of the Tonka Log Transfer Facility (LTF), throughout the Colorado Creek drainage, and in drainages northwest of the LTF. The Colorado Creek drainage had numerous deer beds with molted winter guard hairs, indicating heavy use by deer during summer, and this area is also recognized as high-value deer winter range.

Habitat Capability Modeling

The National Forest Management Act of 1976 mandates that Management Indicator Species (MIS) be identified for forests, and that management alternatives be explored with reference to these species. MIS are vertebrate or invertebrate species whose population changes are believed to indicate the effects of land management activities (Suring et al. 1992a). Habitat capability models were developed to assist in assessments of management approaches by analyzing the capacity of a region to support selected MIS based on measurable habitat qualities. Selection of MIS is based on consideration of the wildlife species present in an analysis area, habitat requirements, the diversity of landforms and vegetative communities, and the capability of wildlife species to adapt to changes in habitat, predation, and other related factors. MIS selected for analysis in the South Lindenberg EIS are Sitka black-tailed deer, black bear, marten (*Martes americana*), red squirrel, river otter, bald eagle, red-breasted sapsucker, hairy woodpecker, brown creeper (*Certhia familiaris*), and blue grouse.

Habitat capability models predict the amount and suitability of wildlife habitat in an area, which are important components in characterizing the existing conditions within a proposed management area. Habitat capability models apportion Habitat Suitability Indices (HSI) to the analysis area using a computer database describing both the particular area (e.g., the South Lindenberg area) and the MIS habitat preferences. HSIs are numerical approximations of habitat quality, based on the existing knowledge of wildlife habitat requirements. Indices range from 0 to 1, with an HSI=0 indicating that the habitat is not capable of supporting the species, while an HSI=1 indicates that habitat is optimal for limiting to the species. Intermediate indices reflect the potential for the habitat to support a proportion of the individuals that could be sustained under optimal habitat conditions.

Suitability indices can be used to estimate the capacity of the area to support the species. If a linear relationship is assumed between habitat suitability and population (USDA Forest

Service, 1991a), predicted carrying capacity for an area can be calculated as the product of area (acres), density of the species in optimal habitat (animals per acre), and the suitability index. For example, an HSI=0.8 indicates that an area is capable of supporting approximately 80 percent of the population that might be expected in the same area if habitat was optimal (HSI=1). Supposing that optimal habitat could support 100 animals per acre, a hypothetical study area of 10 acres with an average suitability of 0.8 has a predicted carrying capacity of 800 animals (10 acres × 100 animals/acre × 0.8).

The utility of habitat models lies in their systematic linkage of measurable forest attributes to the value of wildlife habitat features. Such models provide resource managers with a tool to quantify aspects of wildlife habitat. However, one key concern lies in uncertainty of the relationship between wildlife utilization of specific areas and the generalized assumptions that are incorporated into the mathematical modeling of complex biological phenomena. Habitat capability models typically incorporate current knowledge of wildlife habitat preferences, but scientific review of habitat models is usually ongoing. In addition, the models usually do not directly incorporate non-habitat factors such as predation, disease, or human harvest that may affect wildlife populations as much as habitat factors. Nonetheless habitat capability models provide a systematic, objective, and repeatable evaluation of wildlife resources that is essential to forest planning processes.

more precisely habitat capability for the South Lindenberg MIS species. Data based on vegetative type (TIMTYPE GIS) was utilized in the execution of the model. For ease of interpretation, the modeling results have been summarized as "good," "average," "below average," and "unsuitable" habitats as described in Table 3-7.

Table 3-7
Habitat Suitability for MIS in the South Lindenberg Area (1995)

MIS	"Unsuitable" Habitat [HSI[1] = 0] acres (%)[2]		"Below-Average" Habitat [0 < HSI ≤ 0.3] acres (%)		"Average" Habitat [0.3 < HSI ≤ 0.7] acres (%)		"Good" Habitat [0.7 < HSI ≤ 1] acres (%)	
Sitka black-tailed deer	13,970	(24)	36,289	(62)	7,802	(13)	283	(<1)
black bear[3]	386	(1)	1,078	(2)	31,679	(54)	25,200	(43)
marten	12,116	(21)	23,298	(40)	16,750	(29)	6,189	(11)
river otter	51,679	(89)	2,783	(5)	0		3,882	(7)
red squirrel	1,608	(3)	33,779	(58)	22,958	(39)	0	
bald eagle	55,596	(95)	97	(<1)	2,499	(4)	152	(<1)
red-breasted sapsucker	5,867	(10)	29,519	(51)	1,395	(2)	21,563	(37)
hairy woodpecker	35,376	(61)	11,496	(20)	10,077	(17)	1,395	(2)
brown creeper	46,872	(80)	10,077	(17)	0		1,395	(2)
blue grouse	1,721	(3)	30,078	(52)	514	(1)	26,030	(45)

1 Habitat Suitability Index (HSI) calculated by the respective habitat capability models.
2 Percent (rounded-off) of the total Forest Service acreage in the South Lindenberg analysis area.
3 For black bear only, "good" habitat is ≥0.7 and "average" habitat is <0.7. A considerable proportion of upland habitat utilized by bear is given a suitability index = 0.7, so this was included in the "good" category.

Source: Percival, et al. 1995

Habitat capability modeling can utilize two different methods to derive suitability indices. The "point-grid" system used in the Forest-wide Tongass Land Management Plan Revision (USDA Forest Service, 1991a) apportions HSIs to 20-acre blocks. The "polygon-based" system provides a finer level of differentiation among habitat types by mapping HSIs to areas smaller than 20 acres. The polygon-based system was employed to estimate

The habitat capability models recognize three age-categories of commercial forested habitat: clearcut, second-growth, and old-growth. "Clearcut" designations are applied to any forested habitat that has been harvested within the previous 5 years or has been left unstocked following a harvest. This habitat condition is assumed to persist for 25 years. After 25 years the harvested site is considered to have "greened-up," and the parcel is designated as "second-growth," which is defined as Volume Class 3 (0–8,000 board feet of timber per acre). Second-growth conditions are simulated to persist until year 150, after which the site is recognized as "old-growth" (Volume Class 4 or higher, >8,000 board feet of timber per acre). The GIS database for the South Lindenberg analysis area includes all three age-classes of commercial forest. Thus, modeling of habitats on the South Lindenberg Peninsula considers three general time-periods: 0–25 years (clearcut stage), 25–150 years (second-growth stage), and >150 years (old-growth stage). These age designations will be addressed more fully in the analysis of the environmental consequences of proposed management actions. What now follows are accounts of habitat modeling for each MIS under "existing" environmental conditions.

Sitka Black-Tailed Deer

Sitka black-tailed deer utilize a wide variety of habitats present in the South Lindenberg area. During the summer months, deer may range from subalpine habitats through forested regions and down to tidal lowlands. Winter weather forces deer from the uplands down into lower elevation forests and tidal lowlands. The modeled capability for an area to support deer is based upon the suitability and amount of winter range habitat, because winter severity is a major limiting influence to deer survival in Southeast Alaska (Suring et al.,1992b).

Modeled suitability of deer winter range is a function of multiple habitat characteristics: forest type (old-growth or previously harvested), volume and size classes of trees in the forest, successional stage of the forest, tree species, elevation, aspect, winter severity, and presence of predators (Suring et al., 1992b). Forested land in the South Lindenberg area is almost exclusively hemlock-spruce forest, with low to moderate winter-severity. Consequently, variation in deer winter range suitability within the project area is primarily due to volume class, elevation, and aspect. Wolves are present on the southern Lindenberg Peninsula, and deer are their preferred prey species. The habitat capability model for deer reflects the presence of wolves by reducing modeled density of deer in optimal habitat from 125/sq mi to 100/sq mi. Suitability was modeled using assumptions of moderate winter conditions for most of the study area, but with some site-specific modifications (Doerr, 1993) to the winter-severity data. These changes brought deer habitat capability values more in-line with actual field observations of deer wintering areas and winter forage availability on southern Lindenberg Peninsula (Doerr, 1993).

The deer winter range model indicates that most of the South Lindenberg area is "below-average," and nearly one-quarter is "unsuitable" winter habitat (Table 3-7). "Good" and "average" habitat together make up less than 15 percent. "Good" deer winter range in the area generally occurs at low-elevation forests receiving low winter-severity and along estuarine buffers (Figure 3-10). "Average" winter habitat occurs primarily on forested

Figure 3-10. Modeled Winter Habitat Suitability for Sitka Black-Tailed Deer in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- "Good" Habitat HSI > 0.7
- "Average" Habitat 0.3 < HSI < = 0.7
- "Below-Average" Habitat 0.0 < HSI < = 0.3
- "Unsuitable" Habitat HSI = 0.0

SCALE 1 : 82,000

0 1 2 3 Kilometers

0 1 2 3 Miles

slopes below 800 feet elevation and might include some previous clearcuts (depending on aspect, elevation, and forest type). "Below-average" winter habitat occurs on forested slopes at elevations between 800 and about 1,300 feet (depending on aspect), and on all second-growth commercial-forest habitats. "Unsuitable" winter habitat occurs in all higher-elevation forest land.

Approximately 8,100 acres of "good" and "average" habitat should receive the majority of deer use during winter. The results from generalized habitat capability simulations must be viewed with consideration of the behavior of deer within the area. The lack of abundant "good" winter habitat within the South Lindenberg analysis area does not preclude utilization of the region by deer, but does indicate that the deer winter range in the South Lindenberg analysis area is of lesser overall suitability than winter range found in other areas in Southeast Alaska, due in part to the presence of wolves. Because of the limited amounts of "good" habitat on the southern Lindenberg Peninsula, however, "average" habitat (from a regional perspective) is likely of high importance to deer on the southern Lindenberg Peninsula.

Sitka black-tailed deer depend on old-growth forest for a variety of their habitat needs

Modeled carrying capacity calculations suggest the South Lindenberg area is capable of supporting up to 1,409 deer (Table 3-8). Black-tailed deer were historically abundant on Kupreanof Island, but a series of severe winters in the early 1970s reduced substantially the population inhabiting the island. Deer populations have not recovered to pre-1970 numbers, and the hunting season for deer was closed from 1975 until 1993. Overall factors that have prevented deer populations from recovering to historical numbers are not understood. Predation of deer by wolves and black bear is an ongoing ecological pressure that has contributed to the slow recovery of the Kupreanof Island deer population (Kirchhoff, 1994). It is unknown to what degree the generally-low habitat suitability (as modeled) is a factor limiting the recovery of the deer population.

Table 3-8

Predicted Carrying Capacity (Number of Animals) for MIS in the South Lindenberg Area (1995)

MIS	VCU 437	VCU 438	VCU 447	VCU 448	Total
Sitka black-tailed deer	570	284	454	101	1,409
black bear	43	26	31	5	105
marten	36	20	27	4	88
river otter	16	11	12	1	40
red squirrel	14,644	8,426	11,606	1,742	36,919
bald eagle	26	15	14	2	57
red-breasted sapsucker	2,102	1,203	1,463	226	5,036
hairy woodpecker	186	124	155	22	487
brown creeper	87	122	141	11	360
blue grouse	1,469	900	1,039	186	3,594

Source: Percival et al., 1995

Black Bear

Black bear are primarily herbivorous, but they are also opportunistic omnivores (Suring et al., 1988a). They utilize all available habitats for foraging, although activity in any one habitat varies seasonally. For example, they feed on salmon in estuarine and stream habitats during spawning runs and on forest berries during fall. Black bears prefer old-growth forest with a well-developed understory for cover, but will forage in openings adjacent to forested stands. Bear sign was very common throughout the South Lindenberg area, and bear were directly observed by both the wildlife crews and other IDT members.

The overall habitat suitability for bear is largely a function of food, cover, and available denning sites. For modeling purposes, bear habitat is divided into estuary fringe, beach fringe, upland, and riparian habitats (Suring et al., 1988a). Second-growth riparian areas and muskeg habitat within upland and riparian areas are considered "below-average" habitat. All old-growth forest stands and unforested avalanche slopes, as well as any riparian corridors of high fish production, are considered "good" habitat. Second-growth forest (older than 25 years of age) in upland areas is considered "unsuitable" habitat. All other types of habitat are "average." Forests older than 250 years are preferred for den sites because they provide hollow logs and a dense shrub layer.

The capability model of year-round habitat for black bear indicates that more than a third of the South Lindenberg area is "good" black bear habitat and over one-half is "average" habitat (Table 3-7). Collectively, "below-average" and "unsuitable" habitats compose less than 3 percent of the area. The modeled carrying capacity of the South Lindenberg area is 105 black bear (Table 3-8).

Marten

Marten inhabit old-growth forest and coastal and freshwater habitats. The species is native to Kupreanof Island, but has also been introduced to some other Southeast Alaskan islands by sportsman's groups, fur farm operations, and ADF&G. Specialized features of old-growth forest that are desirable to marten include snags and downed logs, which provide habitat for prey species and cavities for resting and denning. Marten prefer forest with

between 30 and 80 percent canopy cover, and they avoid clearcut areas. The prey base for marten includes small mammals (such as red squirrel), birds, insects, and fruit (Suring et al., 1992c).

Habitat suitability for marten is based on a winter-range limitation to survival and incorporates the occurrence and availability of food and cover (Suring et al., 1992c). Habitat modeling indicates that the South Lindenberg area contains approximately 11 percent "good" marten winter habitat, 29 percent "average," 40 percent "below-average," and 21 percent "unsuitable" (Table 3-7). Calculated carrying capacity is 88 marten (Table 3-8).

For the South Lindenberg analysis area, "good" habitat occurs at elevations less than 800 ft msl in any forest of Volume Class 5 and above, or within 500 feet of beach fringe or riparian corridors (Figure 3-11). This type of habitat has dense cover, dead woody material, and supports prey populations that marten require. "Average" habitat occurs in Volume Class 4 commercial forest or in forests between 800 and 1,500 ft msl. "Below-average" habitat is found at elevations greater than 1,500 ft msl, in forest of Volume Class 3 or below (0 to 8,000 board feet of timber per acre), or in any successional stage other than old-growth. All other habitat is "unsuitable."

Red Squirrel

Red squirrels are associated with boreal coniferous forests on the mainland and several Southeast Alaska islands. Red squirrels eat primarily cones, buds, and mushrooms, but supplement this diet with seeds, fleshy fruits, green plant-matter, other fungi, and insects (Suring, 1988d). Red squirrels of both sexes are territorial, defending areas ranging from 0.5 to 7.5 acres that are centered around nest sites and caches of cones. Squirrels prefer natural tree cavities as nest sites but will use underground and external tree nests when cavities are unavailable (Suring, 1988d).

Overall habitat suitability for red squirrels is a function of food cache sites and food and nest availability (Suring, 1988d). Coniferous forests must be of seed-producing age before they provide enough of a food source to support squirrel populations. Old-growth Sitka spruce forests provide "good" habitat for red squirrels because they produce coniferous seeds and contain downed logs for food caches and snags for nest sites. Old-growth western hemlock, western redcedar, and Alaska-cedar forests provide similar resources but are considered "average" habitat. Clearcuts younger than 40 years of age may be used by red squirrel but are considered "below-average" habitat (cone production in spruce begins at approximately 40 years of age). Muskegs are "unsuitable" habitat.

Habitat capability modeling of year-round habitat for red squirrels indicates no "good" habitat in South Lindenberg (Table 3-7). Over one-third of the area is considered "average" habitat, and over one-half is "below-average." Modeling results suggest that the South Lindenberg area can support approximately 37,000 red squirrels (Table 3-8).

River Otter

River otter are associated with coastal and freshwater aquatic habitats and their immediate (fringe) environs (Suring et al., 1988c). The river otter is a carnivore that utilizes downed-tree root wads and trunks for denning sites and cover. Downed trees in waterways also provide habitat for prey species. Spring denning sites are exclusively located in old-growth forests near streams. Optimal denning habitat occurs below 800 ft msl, but otters utilize sites at elevations as high as 1,200 ft msl. Fish are generally preferred as a food source (Larsen, 1983), but river otter along coastal fringes may also consume a variety of marine invertebrates (e.g., mollusks, crabs, or starfish).

Because food availability for river otter is not easily incorporated into habitat models, habitat suitability is based predominantly on cover attributes, vegetation, and waterbody size (Suring et al., 1988c). Class I and II streams (those potentially supporting anadromous or resident fish) and lakes larger than 50 acres occurring in high volume old-growth forests under 800 ft msl constitute "good" otter habitat. Coastal habitats used by river otter typically occurs within 100 feet of the high-tide line but may extend to 500 feet inland. River otters will not use beaches if they are adjacent to clearcuts (Larsen, 1983). Otters prefer areas free from vegetative debris and dense shrub cover and with canopy cover of greater than 50 percent. Streams and lakes in forests of Volume Class 4 and below, clearcut, and second-growth timber are all "below-average" habitats. Any other habitat is considered "unsuitable." The capability model of spring habitat for the river otter shows that approximately 90 percent of the South Lindenberg area is "unsuitable" (Table 3-7). Remaining habitats are capable of supporting as many as 40 river otter (Table 3-8).

Bald Eagle

Bald eagles are ubiquitous along coastal and inland aquatic habitats in Southeast Alaska, especially along inland seas or broad channels. Nesting occurs in large trees on small islands, narrow tidal passages, and shorelines, usually within 500 feet of the waterbody (Suring et al., 1988b). Although bald eagles are generally described as scavengers, they will forage for live fish, water birds, and invertebrates.

General habitat suitability for the bald eagle is primarily a function of availability of nest sites and proximity to water; elevation, stream class, lake size, and vegetative cover provide additional determining parameters (Suring et al., 1988b). Value as breeding habitat is related to forest structure and composition. Coastal areas with Sitka spruce or spruce- and hemlock-dominated old-growth forest containing Class I streams or lakes greater than 50 acres in size are considered "good" habitats for bald eagle nesting. Any areas greater than 500 feet from the shore and any second-growth forests are "unsuitable" habitat. Western hemlock old-growth forest is "average" habitat, while all non-commercial old-growth forest is "below-average."

For eagles nesting in inland areas, habitat suitability is determined primarily by fish availability (Suring et al., 1988b). Class I streams that support anadromous fish and lakes larger than 50 acres that occur in old-growth spruce, spruce–hemlock, or black cottonwood forests below 800 ft msl provide the only "good" inland habitat for bald eagle nesting. All other old-growth forest is "below-average" habitat, except for western hemlock forest containing Class I streams (which is considered "average" habitat). All areas above 800-feet elevation are generally "unsuitable" as eagle nesting habitat, as are all inland non-riparian areas.

The capability model for bald eagle indicates that 95 percent of the South Lindenberg area managed by the Forest Service is "unsuitable" breeding habitat (Table 3-7). This result reflects the narrow, linear nature of the habitat and the expanse of state- or privately-owned coastline. Modeling results suggest that the South Lindenberg area can support as many as 57 bald eagles (Table 3-8).

Red-Breasted Sapsucker

Red-breasted sapsuckers are considered an important species in Southeast Alaska because they are primary excavators of cavities, which can then be used by secondary cavity nesters (Suring, 1988c). Red-breasted sapsuckers feed on sap, phloem (vascular tissue of trees), insects, and fruit. Nest cavities are excavated in trees having particular characteristics in proximity to suitable foraging habitat. Territories of approximately 10 acres are established and include both the nesting site and foraging areas.

Figure 3-11. Winter Habitat Suitability for Marten in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- "Good" Habitat HSI > 0.7
- "Average" Habitat 0.3 < HSI < = 0.7
- "Below-Average" Habitat 0.0 < HSI < = 0.3
- "Unsuitable" Habitat HSI = 0.0

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Habitat suitability for sapsuckers is primarily a function of snag availability and volume class (Suring, 1988c). "Good" sapsucker habitat consists of old-growth forests of western hemlock and Sitka spruce with low- or mid-volume stands (Classes 3, 4, or 5). High-volume stands provide only "average" habitat, as the canopy is not as open. Muskeg and subalpine forests provide "below-average" habitats primarily because the trees have small diameters and are widely spaced. Clearcuts and second-growth forest provide "unsuitable" habitats. The habitat capability model for red-breasted sapsucker indicates that over one-third of the study area is "good" breeding habitat and one-half is "below-average" (Table 3-7). There is little "average" habitat, and about 10 percent of the area is "unsuitable." The modeled carrying capacity of the South Lindenberg area is 5,036 red-breasted sapsuckers (Table 3-8).

Hairy Woodpecker

Hairy woodpeckers are year-round residents of Southeast Alaska. They nest in both live and dead trees and, like the red-breasted sapsucker, are primary excavators of cavities (Suring, 1988b). Their diet consists largely of beetles, ants, and caterpillars, which they supplement with fruit, nuts, and seeds. Woodpeckers often concentrate in areas with outbreaks of insects. Females establish nesting territories in the fall and maintain them through the winter in order to attract males in the spring.

Habitat suitability for hairy woodpeckers is determined by winter range limitations and food availability. "Good" woodpecker habitat consists of mature, high-volume (Volume Class 6 and 7) stands of western hemlock, Sitka spruce, or Alaska-cedar with multiple dead snags for foraging. Volume Class 5 stands provide "average habitat," and lower-volume stands provide "below-average" habitat. Muskeg, clearcuts, and second-growth forest are generally "unsuitable" habitats because of small tree diameter, absence of cavities, short canopy height, and unavailability in winter due to snow coverage (Suring, 1988b). Modeling of winter habitat for hairy woodpecker indicates approximately 20 percent "good" and "average" winter habitat, 20 percent "below-average" winter habitat, and 60 percent "unsuitable" winter habitat on the South Lindenberg analysis area (Table 3-7). Based on this overall suitability, the modeling results suggest that the South Lindenberg area is capable of supporting as many as 487 hairy woodpeckers (Table 3-8).

Brown Creeper

Brown creeper are also year-round residents of Southeast Alaska and are associated with large, old-growth forest (Suring, 1988a). Their diet consists of insect eggs, larvae, pupae, spiders, other invertebrates, and seeds. Tree size, rather than species, moderates use by foraging brown creepers, as larger trees contain higher densities of larvae and a larger surface-area for foraging. Brown creepers build their nests between the bark and trunk of dying trees or in abandoned woodpecker cavities.

Winter habitat suitability for the brown creeper is determined largely by volume-class limitations (Suring, 1988a). "Good" habitat for the brown creeper is limited to Volume Class 6 and 7 stands of western hemlock and Sitka spruce. These stands possess characteristics that are favorable to foraging, for example, tall trees and large-diameter trunks. Volume Class 5 stands are "below-average" habitat, and all other habitat is considered "unsuitable." Habitat capability modeling of winter habitat for brown creeper produces similar estimates of "below-average" and "good" habitat as was estimated for the hairy woodpecker; however, there is no "average" brown creeper habitat (Table 3-7). The modeled carrying capacity for the study area is 360 brown creepers (Table 3-8).

Blue Grouse

Blue grouse is a common game species in the South Lindenberg area, and several were observed during field verification of resource conditions. Grouse feed on conifer needles, broad-leaved vegetation, flowers, fruits, and invertebrates (Suring et al., 1988d). Male grouse prefer uneven-aged forest with irregular tree heights, a patchy shrub layer, and a discontinuous canopy, while hens with broods prefer an extensive herbaceous layer with proximity to cover. Nest location is determined largely by availability of insects for chicks. In the fall and winter, grouse move to higher elevations where they feed almost exclusively on conifer needles, buds, and cones. Factors influencing use of habitat during winter appear to be the presence of sufficient trees for roosting and escape cover, and an ample supply of needles.

Modeled suitability for blue grouse is based on breeding and brood-rearing habitat. Old-growth forests of western hemlock and western hemlock–Sitka spruce are "good" habitats because they possess the diverse understory and uneven canopy the grouse prefer (Suring et al., 1988d). Clearcuts (0–25 years of age) and muskeg forest are "below-average" habitats; other types of habitat are "unsuitable." Forty-five percent of the study area is modeled as "good" breeding and brood-rearing habitat for blue grouse (Table 3-7), and approximately one-half is considered "below-average." Nearly all of the remaining area is rated "unsuitable." Based on this overall suitability, the modeling results suggest that the South Lindenberg area can support up to 3,594 blue grouse (Table 3-8).

Fish

The South Lindenberg Peninsula includes several small and medium-sized drainages that collectively contain chum, coho, and pink salmon; steelhead and cutthroat trout; and Dolly Varden char. These drainages contribute to a marine sport and commercial fishery and support a limited freshwater fishery. Both the recreational and commercial fisheries are important to the local economy of the area, and these fish populations contribute to the subsistence needs of local communities.

Stream drainages within the Tongass National Forest are categorized according to the types of fish present or potentially present and their flow regime. Class I streams meet one of three conditions: they provide anadromous fish habitat; they would provide anadromous habitat if passage facilities allowed fish to negotiate downstream migration barriers; or they contain resident trout populations considered important for sport fishing. Class II streams support resident fish populations only and generally have steep gradients (6-20 percent) that limit sport fisheries values. Class III streams do not contain fish, although they can affect downstream water quality and fish habitat. Class IV streams are intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat.

Drainage basins within the South Lindenberg area include Duncan Creek (ADF&G Stream Number 106-43-075), Unnamed 1 (106-43-078), Mitchell Creek (106-43-080), Colorado Creek (106-44-046), Skogs Creek (106-44-055), and several smaller unnamed basins which drain into Wrangell Narrows (106-44-048, 106-44-049, 106-44-50, 106-44-053, and other unnumbered streams). Unnamed streams of importance in the assessment area are labeled as Unnamed 1 to Unnamed 7, respectively, in Figure 3-12. As described in the Chapter 3 Watersheds section, the largest basin is Mitchell Creek, followed by Duncan Creek, Colorado Creek, Unnamed 1, and Skogs Creek (Table 3-1).

Figure 3-12. Stream Study Reach Locations in the South Lindenberg Area

Duncan Creek

The Duncan Creek drainage originates in the north central portion of the study area and flows westward into Duncan Canal (Figure 3-12). It has 30.7 stream miles that are designated as Class I or II (Table 3-9). A 30 ft high cascading falls located about 2.1 miles from the mouth of the creek acts as a migration barrier to anadromous fish. Five of the six salmon and trout species present in the area are found downstream of this barrier. Only cutthroat trout and Dolly Varden char occur upstream of the barrier. ADF&G escapement data range from 0 to 487 pink salmon between 1985 and 1990. Little information is available for chum or coho salmon.

Fish passage barrier on Duncan Creek

Table 3-9
Stream Classes in the South Lindenberg Area

Creek	Stream Length (mi) Class I	Class II	Class III	Total
Mitchell	26.0	6.7	15.5	48.2
Duncan	21.8	8.9	36.3	66.9
Skogs	9.1	1.6	8.4	19.1
Unnamed 1	6.8	2.5	7.0	16.3
Colorado	5.9	4.9	4.1	14.9
Unnamed 7	1.9	0.4	1.0	3.3
Unnamed 6	0.0	1.9	0.9	2.8
Unnamed 2	3.3	0.7	2.7	6.7
Unnamed 5	2.4	0.8	0.2	3.4
Unnamed 3	1.7	0.0	0.9	2.6
Unnamed 4	0.7	0.0	0.3	1.1
Total	79.6	28.3	77.4	185.3

The channel type for the mainstem of Duncan Creek is primarily a low gradient floodplain, which has high habitat value. This channel type typically has moderate to large levels of

large woody debris (LWD) which supply overhead cover to fish and is structurally important for determining the channel morphology. The lower portions of major tributaries to Duncan Creek generally have channels of two types: moderate gradient with mixed control channels (MM1 and MM2) and low gradient, contained channels (LC1). In addition, several low gradient channels upstream of the anadromous barrier have been modified by beaver activity and provide excellent overwintering and rearing habitat. Beaver ponds also act as sediment storage areas.

Other channels in the major tributaries have more moderate gradients with boulders and bedrock often helping to contain flows within their banks. Habitat value in these channels is this watershed are generally steep V-notch channels that drain forested slopes. The stream courses on the northeastern portion of this watershed have downslope bank and channel substrates of an alluvial origin. Dry channels of substantive size are present in this high for the trout species and low to moderate for the anadromous species depending upon the availability of pool-forming LWD and the presence of spawning gravels. Fine sediments are usually transported through these moderate gradient reaches. The headwater streams in watershed and indicate a dynamic hydrologic regime. Water temperature has not been identified as a potential problem for this drainage.

Unnamed 1

This watershed also encompasses the northeastern portion of the study area and drains into Duncan Canal between Mitchell and Ohmer sloughs (Figure 3-12). As the fourth largest drainage, the stream includes 9.3 miles of Class I or Class II habitat (Table 3-9). Five of the six trout and salmon species that appear in the study area are found in this drainage; chum salmon is not. An 8 foot falls located approximately 1.8 miles from the mouth of the creek limits access by coho salmon. Within the valley floor, most of this stream is contained within its banks by boulders and bedrock, and it lies on low to moderate gradient slopes. The headwaters of the drainage are relatively steep forested slopes.

Fish habitat is rated as low to moderate primarily due to the relatively coarse substrates present. Rearing and spawning habitat is highly dependent upon LWD to provide plunge pools and to provide localized areas of spawning gravels, which would otherwise be transported through the contained channels. Water temperatures are slightly warmer (<1 °C) than in neighboring drainages, but are still well suited for trout and salmon production. Water temperatures are not expected to be a potential problem in this drainage.

Mitchell Creek

The Mitchell Creek drainage lies in the central portion of the South Lindenberg area and flows in a northwesterly direction towards Duncan Canal (Figure 3-12). Included in this drainage are 32.7 miles of Class I and II streams considered important to anadromous and resident fish production. All six of the salmonid species are present in the drainage. However, ADF&G data suggest only low to moderate pink salmon productivity, with escapement surveys counting from 8 to 300 fish from 4 years of data between 1974 and 1993. A series of two cascades approximately 3.5 miles from the mouth of the creek formerly acted as an anadromous fish barrier. A fish ladder was constructed during 1993 at the lower, more critical cascade and efforts are underway to seed the newly opened habitat upstream of the cascades with coho salmon (K. Johnson, USFS, pers. comm. 1992).

The majority of the mainstem of Mitchell Creek is a low gradient, wide floodplain with some sections more highly contained by bedrock formations. The mainstem is fed by Class I, II, and III tributaries extending up steeper forested slopes to the north and south. Fish habitat is generally good within the drainage, but it is highly variable and dependent on channel type. Low gradient floodplain channels with adequate LWD input typically have good to very good spawning and rearing conditions. In contrast, channels where bedrock contains the flow and which produce low levels of LWD have poor spawning and rearing conditions. The length, width, and low gradient of this stream and the presence of extensive floodplains places the lower reaches at risk of being temperature sensitive. Low flow conditions coupled with long periods (i.e., over a week) of sunny weather may cause temperatures to exceed the

species maximum preferred temperature of 58.3°F for short periods. It is unlikely water temperatures would approach the lethal limit of 78.4°F (Reiser and Bjornn, 1979). Temperatures between 59 and 60°F have occurred when summer weather was dry and warm (late June 1994).

Colorado Creek

The Colorado Creek watershed is located on the southeastern portion of the Lindenberg Peninsula. Streams in this drainage generally flow in a south or southeasterly direction into Wrangell Narrows. The majority of the watershed is in a section of the peninsula with generally lower gradient slopes and large areas of muskeg. The stream network includes 10.8 miles of Class I or Class II streams. ADF&G has documented the presence of coho salmon, pink salmon, and Dolly Varden char in the watershed. Escapement surveys have counted up to 2,700 pink spawners, making it one of the most productive pink runs on the Lindenberg Peninsula. Habitat conditions in the drainage are considered fair to very good, depending upon channel type and the presence of LWD and bedrock control to the channel. No problems associated with water temperatures are expected in the drainage.

Skogs Creek

The Skogs Creek watershed is an important drainage that produces both recreational and commercial fishing opportunities and is relatively easy to access by homeowners living near its mouth on Wrangell Narrows. ADF&G has documented the presence in the drainage of all salmonid species native to the Lindenberg Peninsula, except steelhead. Pink salmon production in the drainage is the best on the southern Lindenberg Peninsula. Escapement surveys have counted upwards of 4,200 pinks from 8 years of data between 1970 and 1993. The watershed includes 10.7 miles of Class I and II streams (Table 3-9). Much of the lower watershed is composed of muskeg with forested areas adjacent to stream channels. Forested areas suitable for timber production occur near the headwaters of the stream on steeper mountain slopes. Habitat in the drainage is rated good to very good with water temperature not considered a potential problem.

Unnamed Drainages 2 to 7

Each of the six unnamed drainages between Colorado Creek and Skogs Creek are relatively small and have limited quantities of suitable habitat for supporting coho populations. Except for Unnamed 6, they have low gradient reaches which provide spawning habitat for pink salmon. Unnamed 6 has an unpassable barrier near its mouth and consequently contains mostly Class II resident fish habitat. No ADF&G escapement data are available for any of these drainages. Due to their small size and east-facing aspect, it is unlikely that water temperatures are a potential problem in these drainages.

Threatened and Endangered Species

Threatened, endangered, or sensitive (TES) species are those listed by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) as threatened or endangered, have recently been proposed or petitioned for listing, are candidates for listing, are considered species of concern, or are designated as sensitive species by the Forest Service (Table 3-10). Such designations may afford these species regulatory protection, and in all cases they invoke special consideration in decisions concerning land management. The following descriptions are for TES wildlife and plant species known to occur, or with potential to occur, on or around Kupreanof Island. There are no TES fish species in the South Lindenberg area.

Table 3-10
Special-Status Wildlife Species Potentially Occurring on or Around Kupreanof Island

Species	Status[a]
Amphibians	
spotted frog (*Rana pretiosa*)	fC2
Birds	
American peregrine falcon (*Falco peregrinus anatum*)	FE
bald eagle (*Haliaeetus leucocephalus*)	P
harlequin duck (*Histrionicus histrionicus*)	fC2
marbled murrelet (*Brachyramphus marmoratus*)	fC2
osprey (*Pandion haliaetus*)	FSS
Peale's peregrine falcon (*Falco peregrinus pealei*)	FSS
Queen Charlotte goshawk (*Accipiter gentilis laingi*)	fC2, FSS
Steller's eider (*Polysticta stelleri*)	PE
trumpeter swan (*Cygnus buccinator*)	FSS
Mammals	
Alexander Archipelago wolf (*Canis lupus ligoni*)	fC2
blue whale (*Balaenoptera musculus*)	FE
bowhead whale (*Balaena mysticetus*	FE
finback whale (*Balaenoptera physalus*) FE	
humpback whale (*Megaptera novaeangliae*)	FE
right whale (*Balaena glacialis*)	FE
Sei whale (*Balaenoptera borealis*)	FE
Steller sea lion (*Eumetopias jubata*)	FT

[a]Regulated Status
FE = Listed as endangered by the USFWS or NMFS.
FT = Listed as threatened by the USFWS or NMFS.
PE = Proposed for listing as endangered.
fC2 = Former Category 2 candidate for listing by the USFWS. Former Category 2 includes species for which existing information indicates taxa may warrant listing, but substantial biological information necessary to support a proposed rule is lacking. These are now considered species of concern by the USFWS.
FSS = Designated as sensitive on National Forests within the Region.
P = Protected species

Endangered Wildlife

An endangered species is considered in danger of extirpation throughout all or a significant portion of its range (USDA Forest Service, 1991b), is protected under the Endangered Species Act of 1973, and elicits regulatory review of projects likely to affect it.

American peregrine falcon–The American peregrine falcon may occur in the study area as a transient, appearing only during seasonal migration. No critical habitat has been designated for this subspecies in the South Lindenberg area.

Humpback whale–The humpback whale has been observed within Duncan Canal (National Marine Mammal Laboratory, 1992) and is a year-round resident in Southeast Alaska.

Other whale species–Sperm whale, finback whale, Sei whale, blue whale, right whale, and bowhead whale are other endangered whale species that are either unlikely to occur or have been observed only sporadically in interior southeast Alaskan waterways. There is no recognized critical habitat for any of these species within the South Lindenberg area, although Duncan Canal potentially supports populations of herring and other food resources for whale species.

Threatened Wildlife

A threatened species is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (USDA Forest Service, 1991b), is protected under the Endangered Species Act of 1973, and elicits regulatory review of land management decisions that may affect it.

Steller sea lion–The Steller sea lion is known to occur in waterways surrounding Kupreanof Island. Haul-outs or rookeries are not known on Kupreanof Island itself (Mello 1992) but historically occurred on the Turnabout Islands off the northwest coast of Kupreanof Island (Calkins, 1986). Sea lions are known to exploit salmon fisheries and other marine aquatic species as food sources (Hoover, 1988), and thus may forage in the marine and estuarine habitats of the southern Lindenberg Peninsula region.

Proposed Wildlife

A proposed species is under current review for listing as threatened or endangered. Because management responsibility for proposed species was granted to the USFWS or NMFS by the Endangered Species Act of 1973, federal agencies are required to confer on planned actions affecting these species or their critical habitat.

Steller's eider–The Steller's eider was proposed for listing by the U.S. Fish and Wildlife Service in July 1994. This bird is an unlikely casual or occasional visitor to Southeast Alaska (Holmberg, 1992), but potentially occurs in the South Lindenberg analysis area. Eiders favor marine habitats, which occur along the Wrangell Narrows and Duncan Canal, tidal flats. Sightings near the Lindenberg Peninsula, however, are very rare.

Candidate and Species of Concern Wildlife

A candidate species is one which is being considered for listing as threatened or endangered but has not yet been proposed for listing. Candidate species are not provided protection under the Endangered Species Act of 1973, but the 1988 Amendments to the Act require monitoring of the status of certain candidate species to prevent their extinction while awaiting listing. A Forest Service Memorandum of Understanding (MOU) provides for the conservation of species that are candidates for listing (USDA Forest Service et al., 1994) to prevent the need for future listing of species under the Endangered Species Act.

As the result of a recent ruling by the USFWS (Federal Register, 28 February 1996), there is currently only one category of candidate species. Under the recent ruling, candidate species are those for which sufficient biological information exists to support official designation, but the administrative process for listing has not been completed. These were previously referred to as Category 1 species. Previous to the February 1996 ruling there were also species having a Category 2 status, which are now considered "species of concern" by the USFWS. These are species for which there is information indicating the species may qualify for threatened or endangered status, but for which further biological information is needed. In the South Lindenberg Timber Sale DEIS, these species are referred to as former Category 2 (or C2) species in addition to being species of concern.

Queen Charlotte goshawk–The Queen Charlotte goshawk is a subspecies of the northern goshawk that inhabits coastal British Columbia and Southeast Alaska (Crocker-Bedford, 1992). The northern goshawk is a former C2 candidate for federal listing (Fed. Reg. 56:58804-58836, 11/21/91), and a national status review of the species has been initiated (Fed. Reg. 1/7/92). The Queen Charlotte subspecies was petitioned for listing on 24 August

1994 with a decision of "listing is not warranted" made on May 19, 1995. The goshawk was designated as a Forest Service Sensitive Species in January of 1994.

The Queen Charlotte goshawk is a year-round inhabitant of Southeast Alaska. Preferred nesting habitat is single-storied old-growth stands with low ground vegetation. Goshawks usually nest in tall trees, as high as 75 feet above the ground (Harrison 1979). Nesting pairs often return to the same nest area year after year (Stokes and Stokes 1979; Harrison 1978), but pairs are not necessarily monogamous nor are the pairings for life. Common prey species are Steller's jay, northwestern crow, varied thrush, and spruce grouse.

Presence and nesting activity of northern goshawk in the South Lindenberg area were evaluated in all proposed harvest units with a minimum of 20,000 board feet of timber per acre. Surveys were performed in June and July 1994 during the nestling and fledgling stages of the northern goshawk's breeding phenology. Inventory methodologies followed *Alaska Region Goshawk Protocol for 1992* (USDA Forest Service, 1992b) and optimal survey times outlined in the *1993 Southeast Alaska Goshawk Surveys Recommended Schedule* (USDA Forest Service, 1993d). These guidelines were modeled after the national goshawk inventory protocol developed by the Forest Service Southwestern Region (Kennedy and Stahlecker, 1991).

Three northern goshawk nests were found in the project area during the 1994 surveys. One nest is located in the Duncan Creek area, one in the central peninsula (the "Mitchell Creek goshawk nest"), and one on state-owned lands on the eastern side of the peninsula near Wrangell Narrows (the "Mountain Point goshawk nest"). All three of these nests successfully fledged young in the 1994 nesting season. The adult female and one of the young from the Mountain Point nest were radio-tagged in 1994. The female was found dead in May 1995; the cause of death has not been determined.

Alexander Archipelago Wolf–The Alexander Archipelago wolf is considered a distinct subspecies of gray wolf (Pederson, 1982) whose numbers are estimated at only about 9,400-1,000 individuals (Kirchoff et al., 1995; Person and Ingle, 1995). This subspecies ranges from the islands south of Frederick Sound and the narrow mainland strip west of the Coast Mountains extending from Dixon Entrance northward to Yakutat Bay (Hall, 1981). Wolves in Southeast Alaska prefer pristine drainages with old-growth forest habitat that provide an abundance of prey. The primary prey species of wolves on the islands is deer (Kirchhoff, 1992), but their diet also includes other mammals and birds (Burt and Grossenheider, 1980). It is a former C2 species that was petitioned for listing on 20 May 1994.

The gray wolf habitat capability model for Southeast Alaska (Suring and DeGayner, 1988) predicts a population size for wolves based on the number of large prey animals (deer, moose, or mountain goat), the edible fraction of those prey, and the food requirements of the wolf. Based on the estimated carrying capacity for deer, the predicted carrying capacity of the South Lindenberg area is four gray wolves. This value does not include any contribution from moose, because the population of moose on the peninsula is unknown. An adult wolf with pups was observed in the project area during 1994 field surveys.

Spotted frog–The spotted frog is a former C2 species known to inhabit muskeg and wetland areas in Southeast Alaska. Its distribution includes the mainland as far north as Skagway. The species occurs in Petersburg on Mitkof Island, but may have been introduced there from the mainland (DeGayner, 1994). There are no confirmed records of spotted frogs on Kupreanof Island, and there is no evidence from targeted surveys or other field investigations that they occur in the South Lindenberg area (Percival et al., 1995).

Marbled murrelet–The marbled murrelet is a former C2 species in Alaska, and occurs on Kupreanof Island. The species is federally listed as threatened in Oregon, Washington, and California, and in British Columbia. In Alaska there are indications that the species may be declining from a population size of 200,000 estimated in the 1970s and 1980s (McCarthy, 1994). Along with the loss of old-growth habitat, marbled murrelet populations are impacted by oil spills, commercial fishing (murrelets get caught in nets), and predation (mainly by ravens, crows, and jays).

The marbled murrelet is a seabird that nests in the canopy of old-growth coniferous forests throughout the Pacific Northwest and Southeast Alaska (Sealy and Carter, 1984). Most nesting activities occur within 45 miles of the coast. Marbled murrelets may be semi-colonial in their nesting habits, as most other members of the auk family are at least loosely colonial. Marbled murrelet pairs share incubation and foraging duties during the nesting season (Ehrlich et al., 1988). While one parent stays on the nest in the forest, the other parents forages at sea for fish. These duties are believed to be switched daily at around the time of sunrise. Both parents spend much of the time at sea foraging for themselves and to provide food for the nestling. When the chick fledges, it flies out to sea to forage on its own. Thus, during later summer and fall, adult and juvenile marbled murrelets can both be surveyed at sea during the day.

Current research has found the highest number of bird detections in old-growth forest patches greater than 500 acres in size; fewer detections have been made in old-growth forest patches 100–500 acres in size; and no detections in old-growth forest stands less than 100 acres in size (USDA Forest Service, 1991b). Even-aged managed stands that are still in early successional stages are generally unsuitable as nesting habitat for marbled murrelets. However, there is evidence of nesting in younger forests in which trees have dwarf mistletoe infestations or other deformations that can provide nesting surfaces (Ralph et al., 1994).

Marbled murrelet surveys were conducted in the South Lindenberg area using standardized inventory protocols developed by the Pacific Seabird Group (Ralph et al., 1994). The unit of measure is the "detection" of one or more marbled murrelets that are either heard or seen by the observer. Marbled murrelet use of a stand is assessed by relative activity levels (detection rates) under the assumption that areas with low detection rates generally have fewer birds than those with high detection rates when sampled at the same time of year (Paton et al., 1990). A "stand" is defined as a group of trees that forms contiguous potential habitat with no gaps wider than 100 meters (Ralph et al., 1994). An "occupied" stand represents potential habitat where marbled murrelets have exhibited subcanopy behaviors that provide evidence of nesting. "Presence" is defined as a stand of potential habitat where marbled murrelets have been detected, but subcanopy behaviors have not been observed. Presence of marbled murrelets may only indicate that the survey station was along a flight corridor used by birds traveling to nesting locations and cannot be used to determine breeding occupancy of stands.

Figure 3-13 presents the "presence" and "occupancy" of proposed South Lindenberg harvest units that were intensively surveyed in 1994. Marbled murrelets were present at all survey sites, but activity levels varied considerably between stands (Table 3-11). Activity levels can reflect the weather conditions during the survey, in addition to actual use by breeding marbled murrelets. Areas of occupancy behaviors or with high activity levels were considered of high value to marbled murrelets in the South Lindenberg area (Percival et al., 1995). Occupancy behaviors were observed within or near more than half of the proposed harvest units that were surveyed.

The upper Skogs Creek drainage and the Colorado Creek drainage both had high marbled murrelet activity and occupancy. High activity levels and occupancy behaviors in these areas of roadless, undisturbed old-growth forest are consistent with current understanding of

marbled murrelet biology (USDA Forest Service, 1991b). The Duncan Creek drainage area generally did not seem to be heavily utilized by marbled murrelets, and this area was considered of lesser importance to breeding marbled murrelets. However, proposed Harvest units 16 and 32 did show high use and occupancy within the stands.

A boat survey for marbled murrelets, other seabirds, and marine mammals was conducted in the nearshore waters around southern Lindenberg Peninsula. Both juveniles and adults were observed, and all 29 marbled murrelets were seen in the Wrangell Narrows. None were observed in the Duncan Canal. Feeding areas of marbled murrelets likely change in response to factors such as tidal conditions, time of year, and time of day, and the results of a one-time survey cannot show preferred feeding areas. It is not known where the marbled murrelets of the South Lindenberg area feed, or even if the birds observed during the boat survey were members of the southern Lindenberg Peninsula marbled murrelet population.

Sensitive Wildlife

A "Forest Service Sensitive" designation is given to those species whose population viability is a concern within the Forest Region. Management for these species is designed to protect habitats that are critical for maintaining numbers and population distribution. These actions are taken to preclude federal listing or Forest extirpation. Sensitive species are afforded no formal protection under the Endangered Species Act of 1973. They are covered in the MOU with other agencies (USDA Forest Service et al., 1994) and thus are given special consideration during assessment and planning processes for proposed activities.

Trumpeter swan–The trumpeter swan nests in the Yakutat and Chilkat Valleys and winters on ice-free areas throughout Southeast Alaska (USDA Forest Service, 1991b). Use of the South Lindenberg area by trumpeter swan is unlikely, given a lack of favorable habitat. However, the species has been observed in the Irish Lakes region of central Kupreanof Island during ice-free winters, in the Blind Slough area of Mitkof Island, and in other areas on Kupreanof and Mitkof Islands (Walsh, 1992).

Osprey–In Southeast Alaska, osprey nest during April through August in hemlock–spruce forests near streams or coastal beaches. Nests are constructed in broken-top spruce (live or dead) and in western hemlock snags (USDA Forest Service, 1991b). Ospreys migrate as far south as Mexico and Central America to overwinter.

No ospreys adults or confirmed nests were observed in the South Lindenberg area during 1994 field activities. Historical nest locations include Kupreanof Island (Hughes, undated)and the Duncan Canal tidal flats (Iverson, 1992). Two osprey nests were reported in the late 1970s in the vicinity of Green Point on the southern portion of the Lindenberg Peninsula.

Peale's peregrine falcon—Peale's peregrine falcon nests have been located in the Tongass National Forest on cliffs 20 to 275 meters high, with the majority of sites facing the open ocean (USDA Forest Service, 1991b). Distribution of peregrine nest sites is closely associated with the presence of large seabird colonies located on the outer coasts or nearby islands. No Peale's peregrine falcon nests have been documented on the Lindenberg Peninsula (Iverson, 1994).

Figure 3-13. Marbled Murrelet 1994 Survey Results in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Proposed Units
- Existing Managed Stands
- Non-National Forest
- Occupancy of the Proposed Harvest Unit
- Occupancy of the Adjacent Forest
- No Occupancy Behaviors Observed; Marbled Murrelets were Present
- No Survey Conducted

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Table 3-11
Activity Levels of Marbled Murrelets of Proposed Harvest Units

Number of Detections	Proposed Harvest Units[1]
0	(none)
1—10	26, 116, 122
11—20	2, 19 & 21, 28, 55, 121
21—30	10, **39 & 42**, 64, **148**
31—40	24, **62**, 65 & 66, 105 & 106, **114**, **119**, **129**
41—50	**16**, 67, **69**, **133**
51—50	**130** (no longer proposed)
61—71	**136**
>71	**32**, **90**, **96 & 97**

[1]Proposed units within occupied stands are indicated in bold type.

Other Protected Wildlife

Bald Eagle–The bald eagle is protected under the 1940 Bald Eagle Protection Act and the 1990 Interagency Agreement established between the U.S. Fish and Wildlife Service and the Forest Service (USDI Fish and Wildlife Service, 1990). These regulations are aimed at protection of bald eagle nesting and wintering habitats. The Interagency Agreement outlines habitat management for bald eagle in areas proposed for timber harvest or other disturbance.

The bald eagle nests from 50 to 200 feet above the ground in old-growth stands. Bald eagles require large bodies of water with abundant fish and adjacent snags or other perches from which to hunt. The bald eagle hunts for fish and waterbirds and is an opportunistic scavenger. Many bald eagle adults, subadults, and nests were observed in the South Lindenberg area during 1994 field activities.

Thirteen stick nests were observed along the shoreline of southern Lindenberg Peninsula during aerial surveys for bald eagle and osprey nests. No nests were observed at Green Rocks Lake or Warm Fish Lake. It could not be determined whether unoccupied stick nests were constructed by bald eagles or ospreys. However, no ospreys were observed during any field activities, whereas as many as 28 adults and 6 subadult bald eagles were observed during a single survey. Most eagles were seen on the eastern coast of the southern Lindenberg Peninsula along the Wrangell Narrows.

TES Plants

No federal threatened or endangered plant species are known to occur in Southeast Alaska (Federal Register, 1994). The only former Category 2 species potentially occurring in the South Lindenberg area is Thurber's reedgrass. The January 1994 Alaska Region Forest Service Sensitive Species List includes 15 plant species that may occur on the Lindenberg Peninsula (Table 3-12). It is Forest Service policy to avoid or minimize impacts to sensitive species, although impacts to individuals of a sensitive species may occur as long as their loss does not contribute to a loss of species viability or a trend toward Federal listing.

A total of 175 plant species were recorded during field surveys of forest, riparian, muskeg, subalpine, and estuarine-beach habitats. One TES plant species *Platanthera chorisiana* (Choris' bog orchid), was found at three locations in the study area, all of which were in muskeg habitat. Species associated with Choris' bog orchid included roundleaf sundew (*Drosera rotundifolia)*, deer cabbage (*Fauria crista-galli)*, Laborador tea (*Ledum groenlandicum)*, skunk cabbage (*Lysichitum americanum*), bog candle (*Platanthera dilitata)*, great burnet (*Sanguisorba officinalis)*, and sticky false asphodel (*Tofieldia*

glutinosa). This species is typically inconspicuous in its muskeg habitat, and populations in these three locations were very small (< 20 individuals in each population). Although Choris' bog orchid is currently listed as Sensitive by the Alaska Region Forest Service, and is noted as a rare species by the Forest Service (USDA Forest Service, 1991e), it has been found to be more common than previously thought (Stensvold, 1994).

Choris' bog orchid (Platanthera chorisiana) is a Forest Service Sensitive plant species that occurs in the South Lindenberg area

Table 3-12
Forest Service Sensitive Plant Species Potentially Occurring in the South Lindenberg Area

Scientific Name[1]	Common Name	Habitat// Range[2]
Carex lenticularis var. *dolia*	(Goose-grass sedge)	wet meadows and lake shores, snowbeds above 600//meters limited to alpine of coastal Southcentral and SE AK; known occurrence in Tongass Nat. Forest, Juneau District
Cirsium edule	(Edible thistle)	wet meadows, woods, forest edges, along glacial streams//endemic in southern SE Alaska
Draba borealis var. *maxima*	(Northern rockcress)	alpine tundra, heath, open woods, often on rock outcrops//limited to Kodiak, Southcentral and northern Southeast AK; known occurrence in Tongass Nat. Forest, Juneau District, Seward Peninsula, and Aleutians
Glyceria leptostachya	(Davy mannagrass)	shallow freshwater, stream and lake margins//regional endemic, Wrangell area in SE Alaska; documented occurrences in Tongass Nat. Forest
Hymenophyllum wrightii	(Wright filmy fern)	humid shaded rocks, bases of trees, decaying wood, also *Mecodium wrightii* rootwads, among moss, in the wettest maritime regions - dense humid coastal forests near saltwater//gametophytes known from the Petersburg and Sitka areas; observed on Biorka and Mitkof Islands
Isoetes truncata	(Truncate quillwort)	shallow water pools or ponds//Prince William Sound to Kodiak, disjunct from Vancouver Is., to be expected in area between; possible occurrences on USFS lands
Ligusticum calderi	(Calder lovage)	alpine//subalpine meadows, open boggy or rocky slopes, rocky cliffs/regional endemic, known from Vancouver Is. through southern SE Alaska (Dall Island), and Kodiak Is., to be expected elsewhere in the Tongass or Chugach Nat. Forests
Platanthera chorisiana	(Choris' bog orchid)	mossy upper beach meadows, swamps, muskegs, heaths from near sea level to 500 feet//scattered from Aleutian Is., Prince William Sound, Southeastern AK; documented occurrences in Tongass Nat. Forest
Platanthera gracilis	(Bog orchid)	wet meadows//limited to southernmost SE AK; documented in Tongass Nat. Forest
Poa laxiflora	(Loose-flowered)	lowland wooded areas in moist shade along upper blue-grass margins of sea, beaches, and in open-forested meadows along riverbanks//known only from Cape Fox on east shore of Revillagigedo Channel and at a hot spring in the Behm Canal area of SE Alaska
Puccinellia kamtschatica	(Kamchatka alkali grass)	wet places, sea beaches//occurrences documented in Tongass Nat. Forest, Juneau District; limited to Southcentral and Southeast AK.
Ranunculus orthorhynchus var. *alaschensis*	(Straight-beak buttercup)	meadows, forests, moist open sites//documented in Tongass Nat. Forest; limited to southern SE AK.
Romanzoffia unalaschcensis	(Unalaska mist-maid)	cracks in rock outcrops, along streambanks, beach terraces, open rocky areas// endemic to Aleutians, Alaska Peninsula, Kodiak and scattered locations east to Sitka; to be expected elsewhere in southern AK
Senecio moresbiensis	(Queen Charlotte butterweed)	alpine and subalpine meadows,//shady wet boggy areas, boggy or rocky slopes, open rocky heaths or grassy areas endemic to southern SE AK, limited to Coronation, Prince of Wales, and Dall Islands in SE AK, documented in Tongass Nat. Forest

Table 3-12

Forest Service Sensitive Plant Species Potentially Occurring in the South Lindenberg Area Continued

Scientific Name[1]	Common Name	Habitat// Range[2]
Stellaria ruscifolia ssp.	(Circumpolar starwort)	gravelly sites along creeks in the mountains//limited to Coastal SE and *leutica* Southcentral AK and Aleutians

[1] *Calamagrostis crassiglumis* (Thurber's reedgrass) a former federal Category 2 species, is not listed on the Alaska Region Sensitive Species List because it has not been found to date on Forest Service land. However, it is here considered a potential occurring TES species because the South Lindenberg area is within the range of the species and has suitable habitat for the species

[2] Habitat and range are as described in Hulten's *Flora of Alaska and Neighboring Territories* (Hulten, 1968) and Anderson's *Flora of Alaska and Adjacent Parts of Canada* (Welsh, 1974).

Source: USDA Forest Service, Alaska Region, January 1994a Sensitive Species List

Several plant species were found in the study area that are ranked as rare by the Alaska Natural Heritage Program (ANHP, 1991). These species include broad-leaf marsh marigold (*Caltha biflora*), hammarbya (*Hammarbya paludosa = Malaxis paludosa*), and bog cranberry (*Oxycoccus palustris*). Hammarbya and bog cranberry occur in muskeg habitat; broad leaf marsh marigold is widely distributed, occurring in forested, muskeg, and subalpine habitat. All three of these species have a global ranking of G5 (demonstrably secure globally) and therefore are not considered in danger of becoming extinct. However, because they are on the edge of their ranges in Alaska, they are ranked as rare within the state.

Biodiversity

The concept of biodiversity encompasses the variety of biotic elements that collectively characterize the diversity of organisms, communities, and ecosystems of a particular area or region. The U.S. Office of Technology Assessment (OTA) defines biodiversity as "...the variety and variability among living organisms and the ecological complexes in which they occur" (OTA, 1987). Biodiversity includes compositional (e.g., numbers of species), structural (e.g., habitat complexity), and functional (e.g., nutrient cycling) components (Noss, 1990; Sharitz et al., 1992). Biodiversity addresses natural diversity of organisms at many levels:

- global (biome diversity, global species richness);
- regional (landscape patterns, ecosystem diversity);
- ecosystem (functions and processes);
- community (species interactions, community structure);
- species (maintenance of viable populations); and
- genetic (genetic diversity, maintenance of gene pools).

It includes recognition that all organisms are important, not just sport or subsistence, or commercial species. Special recognition is also given to natural processes and changes in community structure that evolve over time. In addition, considerations such as large core areas, migration, and habitat transitions and mosaics are important spatial elements of biodiversity.

This description of biodiversity resources of the South Lindenberg area focuses on the range of habitats, the extent and distribution of old growth forest, and the diversity of species that

occur in the area. Although much of the information presented in this section is drawn from other resource studies for the South Lindenberg EIS (e.g., wildlife, fisheries), this discussion of biodiversity is not intended to merely repeat this information, but rather to integrate it into a broader, landscape scale view of biotic resources of the South Lindenberg area.

Physical Processes and Characteristics

Physical processes and characteristics such as geology, climate, and hydrology determine the opportunities and limitations for plant and animal life and their interactions. The extent and nature of biodiversity within a region depends on the degree of habitat heterogeneity, natural disturbance, resource availability, and environmental severity, which are all in part a result of these physical processes.

The South Lindenberg area is part of the extensive archipelago that comprises much of Southeast Alaska. Its peninsular and island location retards the migration of many plant and animal species between the South Lindenberg area and other portions of Kupreanof Island, the mainland, or other islands, and is an important consideration in the viability of populations.

Geological substrates in the area (metamorphic rocks, granitic intrusions, glacial till) are common in Southeast Alaska, and unusual substrates that commonly harbor rare plant populations are not present. The South Lindenberg area is a mix of gently sloping to flat terrain and steep slopes occurring on several ridges and peaks that reach 3,250 feet in elevation. This geomorphic setting occurs within one of the wettest climates on earth. High annual precipitation (averaging over 100 inches in Petersburg) in a relatively mild, marine climate results in dense temperate rainforests and extensive boggy areas, known regionally as muskeg. Heavy winds often accompany major winter storms, and windthrow is the primary form of natural disturbance to forest communities in Southeast Alaska, with fire playing a very minor role (Alaback and Juday, 1989).

Watersheds in the South Lindenberg area are generally small, with two watersheds > 20 mi^2 (Mitchell and Duncan creeks) and three watersheds between 5 and 10 mi^2 (including Skogs and Colorado creeks). Natural barriers to fish passage occur in the lower portions of Mitchell and Duncan creeks, although a fish passage facility has been constructed on Mitchell Creek. There are two small lakes in the area: Green Rocks Lake along the Wrangell Narrows and Warm Fish Lake in the Duncan Creek drainage. Marine shoreline occurs along Duncan Canal on the western side and along Wrangell Narrows on the eastern side of the South Lindenberg area.

Distribution of Habitat Types

Retention of various habitat types in an area is considered a "coarse filter" strategy for preserving biodiversity. This strategy assumes that characteristic species and ecological processes will be preserved as long as the vegetation communities or habitat types are preserved. The South Lindenberg area contains nine habitat types that broadly represent major vegetation types. By far the most abundant habitat type is forest, comprising approximately 53 percent of the analysis area (Figure 3-14, Table 3-13). Forest-muskeg complex is the second most abundant habitat type (22 percent). Areas mapped as non-forested muskeg in the Stikine Area GIS database total 6 percent of the study area. Also present are subalpine-alpine areas, alder mountain slopes, riparian, estuarine fringe, and beach fringe habitats.

Forest

Forest habitat is dominated primarily by western hemlock and Sitka spruce, with Alaska yellow cedar and shore pine secondary in importance. Mountain hemlock is also found in the analysis area at elevations above 1,500 ft. Although classified here as one habitat type, forested areas are quite diverse, ranging from high volume old-growth stands dominated by Sitka spruce and western hemlock to scrubby stands of shore pine mixed with muskeg. Productive forest stands generally occur on better drained sites, such as moderately steep

slopes and floodplain areas. As soils become more poorly drained, forest stands diminish in volume eventually grading into scattered shore pine within muskeg.

Forests of South Lindenberg are diverse in the size and amount of living trees, large dead standing and fallen logs, composition and density of understory, and degree of canopy closure. This diversity in structure occurs mostly in smaller patches of one to several acres, consistent with the scale of windthrow disturbance in forests of Southeast Alaska (Harris, 1989). Mass wasting may also be a factor in creating structural diversity in these forests.

Existing Managed Stands

There has been more than 3,300 acres of timber harvested on the southern Lindenberg Peninsula since the 1930s. Harvest has been concentrated along the Duncan Canal shoreline and in the watersheds of Mitchell Creek, Duncan Creek, and unnamed creek 1 immediately south of Duncan Creek. Depending on time since harvest, these clear-cut harvested areas range from closed canopy second-growth forest to very recently harvested areas with herbaceous and shrub cover.

The road system constructed to access the harvest units has resulted in a minor amount of disturbed roadside vegetation. Non-native grass species such as orchard grass *(Dactylus glomerata)*, velvet grass (*Holcus lanata*) and timothy (*Phleum pratense*) occur along the roadway and have probably been introduced as part of erosion control measures. Exotic species have not invaded undisturbed areas.

Muskeg

Muskeg is scattered throughout the study area and occurs typically on flat to gently sloping sites. An extensive muskeg area occurs in the northeastern portion of the study area on a broad, low elevation plain west of Duncan Peak in the Skogs Creek drainage. Other areas with substantial muskeg occur in the valleys of Colorado, Duncan, and Mitchell creeks. The species composition of muskeg vegetation varies. Typically there is a matrix of sphagnum moss. Within this matrix, there are a variety of low growing shrubs in the heath family, such as bog laurel, Labrador tea, bog blueberry; herbaceous dicots, such as deer cabbage, caltha leaved avens, buckbean, and round-leaved sundew; and sedges. Stunted shore pine, western hemlock, and Alaska yellow cedar occur as 10 to 15 feet high individuals or in small groves scattered throughout the muskegs. Muskegs often contain small ponds and are underlain by peat deposits up to 30 or 40 feet deep.

Mixed Forest-Muskeg

Mixed forest-muskeg occurs where these two habitat types exist in a mosaic of relatively small patches. The muskeg portions of this habitat type are similar in species composition to large muskeg areas. The forested portions tend to be scrubby and are not considered commercial forest land. Shore pine is more common in these forested portions, while Sitka spruce is largely absent. Western hemlock and Alaska yellow cedar are also typically present.

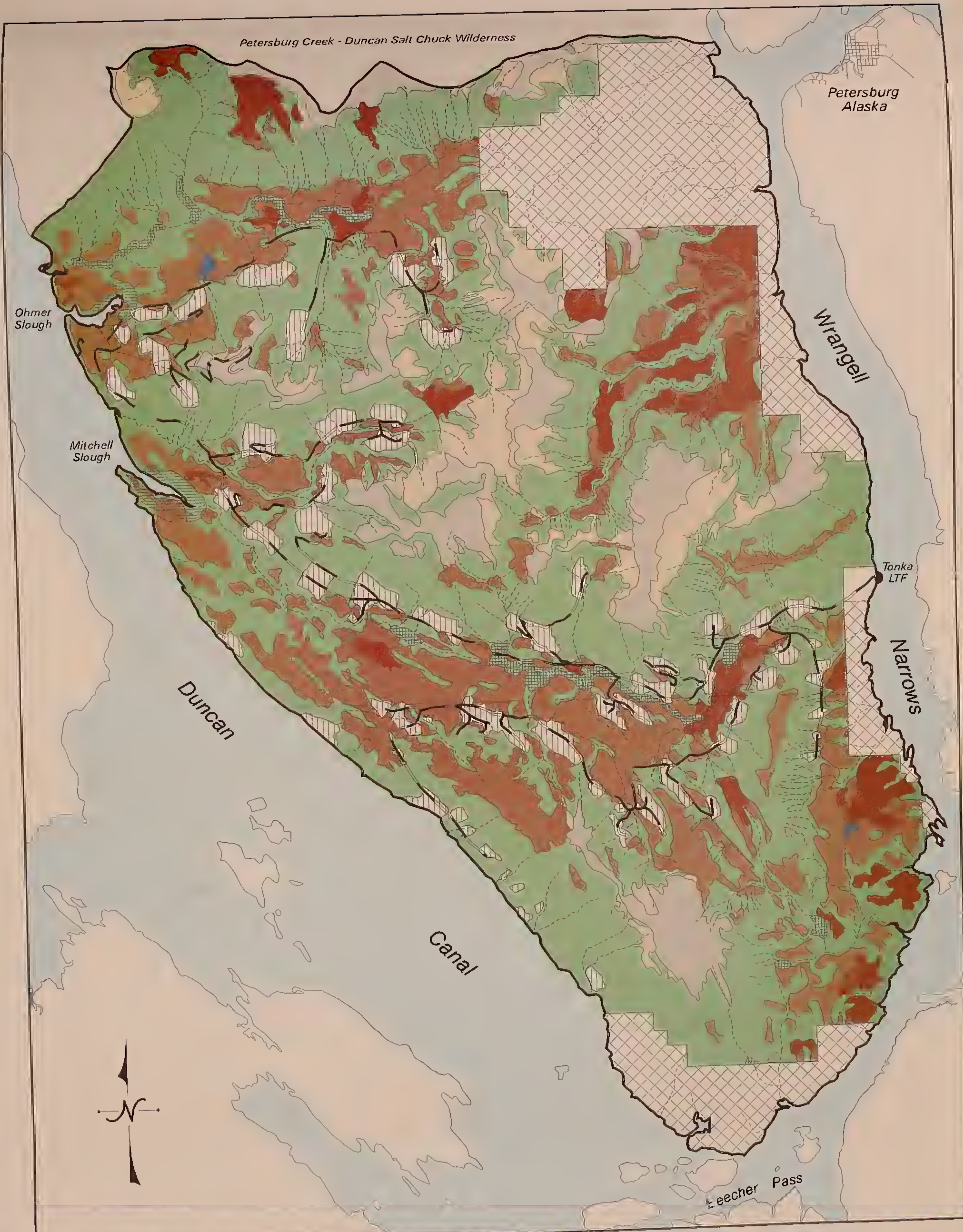


Figure 3-14. Habitat Types in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- Lakes
- Forest
- Forest-Muskeg Complex
- Muskeg
- Alder Mountain Slopes
- Subalpine
- Riparian
- Estuarine Fringe

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Table 3-13
Biodiversity Elements and Characteristics for South Lindenberg

Biodiversity Element		Characteristics
Physical Processes		
Geology/Geomorphology		Mostly sedimentary and metasedimentary bedrock with surface deposits of glacial till. Flat to moderately hilly terrain, with a few high ridges over 2,500 feet.
Climate		High precipitation; high winds during winter a major disturbance factor; low spatial variability in climatic conditions.
Soils		Spodosols in forests, deep peat deposits in muskeg. Mass wasting occurs on steep slopes.
Hydrology		Several large streams with average annual discharges typical for lowland Southeast Alaska. High water table and saturated soils throughout area.
Habitat Types		
Forest	30,080 acres	Primarily western hemlock and Sitka spruce, with lesser amounts of Alaska yellow cedar, shore pine, and mountain hemlock.
Forest-Muskeg Complex	13,016 acres	Similar distribution as muskeg.
Subalpine	4,653 acres	Several high ridges within area, with mountain hemlock forest grading into open subalpine shrubs and herbs.
Muskeg	3,842 acres	Throughout South Lindenberg area on flat to gently sloping sites.
Existing Managed Stands	3,345 acres	Timber harvest on South Lindenberg Peninsula began in 1930s; most harvest along marine shoreline and in watersheds of Mitchell Creek, Duncan Creek, and unnamed creek south of Duncan Creek.
Alder mountain slopes	3,251 acres	On steep slopes subject to mass wasting and avalanches; typically on higher, larger ridge systems.
Lakes	39 acres	Two small lakes in analysis area: Warm Fish Lake in Duncan Creek drainage and Green Rocks Lake in Colorado Creek drainage.

Table 3-13
Biodiversity Elements and Characteristics for South Lindenberg
Continued

Biodiversity Element		Characteristics
Beach Fringe	1,246 acres	Approximately 20 miles of gravel-rocky shoreline along Duncan Canal and Wrangell Narrows.
Riparian	662 acres	Shrub areas dominated by salmonberry and thimbleberry; forested areas mostly coniferous, with some red alder.
Estuarine Fringe	379 acres	Approximately 3 miles of estuarine-tidal mudflat shoreline along Duncan Canal.

Note: Beach fringe, estuarine fringe, and riparian areas overlap other habitat types. Areas of forest/nonforest differ from Table 3-3 due to use of different GIS data layers to calculate habitat types.

Old-growth Forest by Volume Class

(Note: Old-growth forest is restricted to areas coded as Stand Size class 4 in the Timber Type data layer, Stikine Area GIS database.)

Volume Class 4 (8-20 MBF)	13,486 acres
Volume Class 5 (20-30 MBF)	11,571 acres
Volume Class 6 (30-50 MBF)	1,497 acres
Volume Class 7 (> 50 MBF)	0 acres
Total	26,554 acres

Interior Old-growth Forest	Prior to All Harvest	Existing Conditions
	17,267 acres	14,217 acres

Forest Fragmentation

	Prior to All Harvest		Existing Conditions	
Block Size	Total Acres	Number of Blocks	Total Acres	Number of Blocks
< 100 acres	814	52	964	118
100-500 acres	461	4	13,071	7
501-1000 acres	857	1	1,413	2
> 1000 acres	31,652	6	26,940	5

Table 3-13

Biodiversity Elements and Characteristics for South Lindenberg

Continued

Biodiversity Element	Characteristics
Management Indicator Species	**Habitat Suitability**
Sitka black-tailed deer	Low amount (< 15%) of average to good habitat. Indicator for high-volume old growth at low elevations and south aspect.
Marten	Moderate amount (> 30%) of average to good habitat. Indicator for moderate to high-volume old growth at low elevations or near aquatic areas.
Black bear	Most of South Lindenberg area is average to good habitat (> 80%). Indicator of overall habitat diversity and quality.
River otter	Most of South Lindenberg area is unsuitable, since average to good habitat limited to old-growth forest adjacent to aquatic areas.
Red squirrel	Most of South Lindenberg area (> 97%) is below average to average habitat. General indicator for old-growth forest in area.
Bald eagle	Most of South Lindenberg area is unsuitable, since average to good habitat limited to old-growth forest adjacent to aquatic areas.
Red-breasted sapsucker	Moderate amount (> 30%) of good habitat. Indicator for low- to mid-volume old growth.
Hairy woodpecker	Low amount (< 20%) of average to good habitat. Indicator for high-volume old growth.
Brown creeper	Very low amount (< 5%) of average to good habitat. Indicator for high-volume old growth.
Blue grouse	Moderate amount (> 40%) of good habitat. General indicator for old growth.

Subalpine

No true alpine habitat occurs in the South Lindenberg area, but there are several high ridges above 1,500 feet elevation where subalpine vegetation occurs. This habitat on Kupreanof Island consists of forest dominated by mountain hemlock opening up into herbaceous and shrubby areas. Subalpine flora on Duncan Peak in the study area include several sedges, cottongrass, partridgefoot, deer cabbage, caltha-leaved avens, and narcissus anemone.

Typical subalpine shrubs are mountain heather and oval-leaved blueberry. Many species found at lower elevations when present in the open subalpine areas were generally reduced in size. Subalpine areas in South Lindenberg are likely used as travel routes by most large mammals and as summer forage for Sitka black-tailed deer and bear. Mountain goats do not occur on Kupreanof Island.

Alder Mountain Slopes

Mass wasting and avalanche activity on steep mountain slopes in the South Lindenberg area preclude establishment and persistence of trees. Sitka alder is particularly well adapted for growth under these conditions, and there are extensive areas of dense alder shrubs, primarily at higher elevations. These areas are considered good habitat for black bear.

Riparian

Riparian habitat is located along the banks of larger streams (e.g., Duncan, Mitchell, and Colorado creeks) and lakes. Riparian vegetation in the South Lindenberg area is varied, including shrub and both deciduous and coniferous forested communities. Shrub communities along stream riparian areas are typically dominated by salmonberry, Sitka alder, and thimbleberry. Shrub communities along the lakes were dominated by heath species such as bog laurel, Labrador tea, and dwarf blueberry. Red alder is the only deciduous tree species common in forested riparian communities, it is often mixed with coniferous species such as western hemlock and Sitka spruce. Sitka spruce trees occurring in the floodplain of larger streams are often very large, sometimes reaching over seven feet in diameter. Although willow is not a common riparian species in the South Lindenberg area, a 10 acre area of dense willow occurs in a beaver pond area in the upper Duncan Creek drainage (Doerr, 1992). This area is of particular importance because willow has high forage value to moose and is quite limited on the southern Lindenberg Peninsula. This area appears heavily browsed by moose.

Estuary and Beach Fringe

Because of their proximity to shoreline habitat and resources, estuary and beach fringe habitats are of special importance to many species of wildlife. Coniferous forest typically extends to near the high tide line, although red alder often occurs in a narrow band at the forest edge. Wildlife species that utilize resources of intertidal ecosystems depend on these areas for cover and transportation. Beach fringe in the South Lindenberg area is extensive, bordering the entire east and west sides of the study area. Two small estuarine areas occur, one at the mouth of Mitchell Creek and the other in Ohmer Slough, both in the northwestern portion of the South Lindenberg area.

Amount and Distribution of Old-Growth Forest

Old-growth forest is of major importance to biodiversity in Southeast Alaska because it provides critical habitat to a variety of wildlife species. It is diminishing in extent due to timber harvesting. Several attributes of high-volume old-growth forest (more than 30 MBF/acre or Volume Class ≥ 6) provide unique habitat features that do not occur in young stands (Schoen et al., 1988). Large standing-dead trees are important to cavity nesting birds, and downed trees are critical to nutrient cycling processes and reducing soil erosion.

High volume old-growth forest provides important winter habitat for Sitka black-tailed deer because the closed canopy filters out heavy snow while the open understory provides adequate forage. These characteristics are lacking in dense second-growth stands and in more open canopy, low-volume forests.

Approximately 46 percent of the total area and 87 percent of forested habitat in the South Lindenberg area is classified in the Stikine Area GIS database as old-growth forest, defined here as sawtimber ≥ 9 inches diameter and ≥ 150 years old (Table 3-13). Most old growth is in mid-volume stands (Volume Classes 4 and 5), while less than 6 percent of old-growth forest is considered high volume (Volume Classes 6 and 7 or > 30 MBF/acre). High-volume old growth is limited on Kupreanof Island due to wet soil conditions and is most prevalent on moderately steep slopes and floodplains where soils are well-drained. High-volume stands of old growth are most abundant in the northern portion of the study area and in an area northwest of the Tonka Log Transfer Facility (LTF). There are also some substantial stands of high volume old-growth along the ridge system south of the LTF and in scattered

Estuaries are a limited but important element of biodiversity in the South Lindenberg area

locations in the southern portion of the study area. These high-volume stands are mostly found within lower-volume forests (Figure 3-15).

There is some evidence that many old-growth dependent species preferentially utilize interior old-growth forest (defined as old-growth forest inside a 300 foot buffer along all edges), away from the effects of non-forest areas. The amount of interior old-growth forest existing in the South Lindenberg area is about 54 percent of the total old growth and 46 percent of total forest area.

Forest Fragmentation

Since the value of old-growth habitat to many old-growth dependent animal species is related to the area of contiguous forest habitat, the distribution and size of these areas are important attributes to consider in assessing impacts of timber harvest on old-growth forest. Because non-old growth forested areas adjacent to old growth moderate edge effects and likely serve as travel corridors, they are important to include when assessing the effects of fragmentation (Chapin, 1996). Consequently, this analysis of fragmentation included both old-growth and non-old growth forest together in one GIS coverage or layer. As Figure 3-14 clearly shows, forest in the South Lindenberg area is not continuously distributed across the landscape, but rather exists naturally as a somewhat dissected forest in a mosaic with other habitat types. Natural fragmentation is an inherent characteristic of these forests and no doubt plays an important role, apart from the effects of timber harvesting on fragmentation, in the value and abundance of suitable habitat for old-growth dependent species.

Almost all of the forested habitat of the South Lindenberg area occurs within one contiguous area which consists of several large concentrations of forest connected by relatively narrow forested corridors. For the purpose of this analysis, these concentrations of forest were delineated as "blocks" to assess how past and proposed harvest affect forest fragmentation. Prior to any harvest in the South Lindenberg area, six blocks, each greater than 1,000 acres, comprised 94 percent of forested land (Figure 3-16).

Today one of these blocks (south of Mitchell Creek) is no longer greater than 1,000 acres, and three others have experienced some fragmentation due to harvest (Table 3-13). Balancing these decreases in the large forested subareas, there have been increases in the area and number of smaller blocks of forest.

Although previous harvest has reduced the area of forest occurring in large blocks, 88 percent of the present forested area in the South Lindenberg area still exists in large contiguous areas greater than 1,000 acres in size, most of which is old-growth.

The analysis of area alone, however, does not take into account two important factors that may also pertain to habitat quality for old-growth dependent species. First, the larger blocks of forest on Kupreanof Island are in a pattern of dissected contiguous forest rather than continuous forest not broken up by other habitat types. Second, the distribution of high-volume old-growth forest is dispersed in many patches, mostly less than 100 acres. How wildlife are affected by this distribution of forest compared to that of large, unknown blocks of forest is not well known. Although these patches usually occur within larger low-volume forest, they may be effectively below optimal patch size for some species (e.g., Sitka black-tailed deer) that have habitat requirements unique to high-volume forest.

Figure 3-15. Distribution of Old-Growth Forest in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- Old-Growth Volume Class 4
- Old-Growth Volume Class 5
- Old-Growth Volume Class 6

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Figure 3-16. Forest Blocks in the South Lindenberg Area Prior to any Timber Harvest

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Non-National Forest
- Forest < 1000 Acres
- Forest > 1000 Acres Block 1
- Forest > 1000 Acres Block 2
- Forest > 1000 Acres Block 3
- Forest > 1000 Acres Block 4
- Forest > 1000 Acres Block 5
- Forest > 1000 Acres Block 6

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Wildlife and Management Indicator Species

The assemblage of vertebrate animal species in the South Lindenberg area is typical for this portion of Southeast Alaska (see Wildlife section). Evidence of deer and black bear was abundant, although the number of individuals observed during 1994 studies was very limited. Other animals recorded during the surveys include moose, wolf, river otters, beaver, red squirrel, porcupine, two amphibians, and 45 bird species from 22 families (Percival et al., 1995).

Management Indicator Species (MIS) and habitat capability models (HCM) can be used to assess the relative capability of an area to support its characteristic assemblage of species (see Wildlife section). Modeling for 10 MIS indicate that the habitat capability of the South Lindenberg area varies strongly depending on what species is being considered. In general, these results indicate that the South Lindenberg area has a relatively low habitat capability for species dependent on high-volume old-growth (e.g., Sitka black-tailed deer, hairy woodpecker, and brown creeper), although these species depend on this type of forest for different reasons. In contrast, there is a moderate amount of average to good habitat capability for forest dwelling species not requiring the structural characteristics of high-volume old growth (e.g., marten, red squirrel, red-breasted sapsucker, and blue grouse). Most of the area is unsuitable for river otter and bald eagle because these species depend on the presence of aquatic habitat in proximity to old growth forest. In contrast, black bear is a far ranging omnivore that utilizes a wide variety of habitats, and more than 75 percent of the South Lindenberg area has average to good black bear habitat.

TES Plants and Animals

Threatened, endangered, and sensitive species are useful as indicators of biodiversity because they serve to focus conservation efforts. Emphasis is placed on preserving species that are vulnerable to population declines or loss and that may not be preserved solely by use of a strategy of preserving habitats. By knowing what TES species occur in the South Lindenberg area and where they occur, the harvest alternatives can be evaluated as to their affects on this biodiversity element.

There are no Federally listed plant species that are known to occur in the South Lindenberg area or in Southeast Alaska. Choris' bog orchid is the only Forest Service sensitive plant found to date in the study area. Broad-leaf marsh marigold, hammarbya, adder's mouth, and bog cranberry are also found in the area. Because these species are at the edge of their ranges in Alaska, they are considered rare in the state, but are known to be secure globally. All these plants are found in muskeg, but broad-leaf marsh marigold is also common in forested and subalpine habitats.

Animal TES species known to utilize the interior areas of the South Lindenberg peninsula include marbled murrelet, Queen Charlotte goshawk (FS sensitive), and Alexander Archipelago wolf (all former federal Category 2). Marbled murrelets are of increasing concern due to their reliance on old-growth forest habitat. Heaviest concentrations of murrelet activity occur in the upper portions of the Skogs Creek drainage and in the Colorado Creek drainage, based on surveys in areas proposed as harvest units for the South Lindenberg Timber Sale.

Three nesting sites of Queen Charlotte goshawk were found in the South Lindenberg area, although again surveys were limited to proposed units and roads. One nest was located in the Mitchell Creek drainage, one on the east side of the peninsula south of Skogs Creek, and one in the northwestern portion of the study area north of Duncan Creek. All of these nest sties were found in moderate to high-volume old growth. The discovery of three nest sites on the peninsula with a relatively limited amount of area surveyed indicates that goshawks utilize much of the study area.

Alexander Archipelago wolf is known to utilize the South Lindenberg Peninsula and was observed by field personnel in the study area during 1994. Little is known, however, about population densities in the area. It is presumed that the population density of wolf in the study area is linked to abundance of Sitka black-tailed deer, based on studies of wolf elsewhere in Southeast Alaska (Kirchhoff,1992).

Fisheries Habitat and Populations

Aquatic resources, and salmonid fish species in particular, are an important component of Southeast Alaskan ecosystems. They are a major food source of bear, river otters, and bald eagles, and they act as a critical link among terrestrial, aquatic, and marine environments. Six salmonid fish species are found within the South Lindenberg area: chum, coho, and pink salmon; steelhead and cutthroat trout; and Dolly Varden char, all of which are found throughout Southeast Alaska. Information on the distribution of these species among the different watersheds is incomplete, but Mitchell and Duncan creeks contain all of the six species, while Skogs and Colorado creeks contain five and three species, respectively. The only salmonid species common in Southeast Alaska that is lacking in streams of the South Lindenberg area is sockeye, which require lakes accessible to anadromous fish. Other species potentially occurring in the study area include coast range sculpin, prickly sculpin, longfin smelt, rainbow smelt, three-spine stickleback, and eulachon. The area is not known to contain any unique or endemic species.

Most fish populations within the South Lindenberg area are anadromous (i.e., a life history in which fish spawn in fresh water, but spend at least part of their lives in saltwater). Anadromous populations occur in every major drainage of the South Lindenberg area, and only some cutthroat trout and Dolly Varden populations are non-anadromous, or "resident." Because interbreeding of anadromous fishes from different drainages is rare, anadromy often results in populations with unique genetic characteristics. Preservation of these unique gene pools is a major goal of biodiversity related management. Specific management actions include the maintenance of healthy, indigenous populations and avoiding the introduction of non-indigenous stock (e.g., hatchery raised fish from non-native parents).

Overall Assessment of Biodiversity

Biodiversity in the South Lindenberg area appears typical of undisturbed, forest-dominated environments of Southeast Alaska. The area encompasses a range of habitat types, although mountainous areas are minor in extent compared to some locations in the region. Except for estuarine and beach fringe habitat, non-forested habitat (e.g., muskeg, alder dominated slopes, and subalpine meadows) is dispersed throughout the area. This pattern of forest and non-forest enhances habitat heterogeneity, but may result in reduced populations of old-growth dependent species. Because most of the old-growth forest is broken up by intervening non-forested habitat, it occurs in a dissected rather than continuous pattern of forest cover. Forested corridors, however, connect larger areas of forest. Contiguous areas of forest currently provide old-growth habitat in much greater than optimal patch size for many old-growth dependent wildlife. Because the amount of high volume old-growth forest is relatively low, habitat for animals that require the structural features of high-volume old-growth forest (e.g., Sitka black-tailed deer) is not abundant.

There are no federally listed threatened or endangered plant or animal species that are known to be resident in the South Lindenberg area, but several species of concern (e.g., northern goshawk, marbled murrelet, Alexander Archipelago wolf, Choris' bog orchid) have been recorded. A few exotic plant species were observed along the existing road system, and may have been introduced intentionally as part of erosional control measures. The diversity and abundance of fish populations are a significant contribution to the area's biodiversity and provide an important resource to several species of wildlife. The South Lindenberg area supports an assemblage of plants and animals that is representative of natural conditions in this region and does not appear to have any characteristics that contribute to unusually high or low regional biodiversity.

The South Lindenberg area is centrally located within the Tongass National Forest and thus occurs within the broader context of natural characteristics and land-use designations of

Southeast Alaska. There is less high volume old-growth forest in the South Lindenberg area (> 30 MBF/acre) than on neighboring islands such as Kuiu, Mitkof, Admiralty, and Prince of Wales. The area has undergone some harvesting and resulting fragmentation, and it has an existing road system. Most of the South Lindenberg Peninsula has a land-use designation (LUD) of Timber Production (although the selection of the final land management plan for the Tongass National Forest has not been made).

Subsistence

With the passage of the Alaska National Interest Lands Conservation Act (ANILCA), the U.S. Congress recognized the importance of subsistence resource gathering to the rural communities of Alaska. ANILCA (16 USC 31130) defines subsistence as:

> *The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade.*

ANILCA provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on public lands." It also legislates that "customary and traditional" subsistence uses of renewable resources "shall be the priority consumptive uses of all such resources on the public lands of Alaska." Non-rural residents are not provided a preference for the taking of fish and wildlife on public lands. Juneau and Ketchikan are the only communities in Southeast Alaska that have been determined to be non-rural by ANILCA and the Federal Subsistence Board.

Communities Traditionally Using the Lindenberg Peninsula

Maps produced by the ADF&G Division of Subsistence reveal that residents of Petersburg use the Lindenberg Peninsula extensively for subsistence harvest, especially for deer and salmon (Figure 3-17). Residents of Wrangell also use the study area, but to a much lesser extent than their counterparts from Petersburg. Natives from Kake used the area extensively before the area was settled by non-Indians, but Kake residents no longer use the area except for some possible deer hunting around Petersburg Creek and Wrangell Narrows (Firman and Bosworth, 1990). Point Baker and Port Protection residents are not documented as using the Lindenberg Peninsula for any subsistence activities (Kruse and Frazier, 1988) although they are active elsewhere in the region.

According to the documents produced by the Tongass Resource Use Cooperative Survey (TRUCS), Petersburg residents use approximately 47 percent of the South Lindenberg study area for deer hunting. In contrast to the usual Southeast Alaska pattern of hunting mostly along the beach fringe, Petersburg deer hunting maps show hunting activity deep into the peninsula's interior (Figure 3-17). This pattern is evident in both the ADF&G's Technical Paper 164 (Smythe, 1988) and the information collected by TRUCS. Scoping comments received for the South Lindenberg EIS affirm these historical subsistence surveys, and indicate that historical hunting areas were revisited during the 1993 deer hunt (Hyatt, 1994).

Petersburg residents also use the Lindenberg Peninsula for hunting ducks, geese, and upland birds, especially in the Duncan Canal area and along the Tonka logging road (Smythe, 1988). The beach fringe, interior streams, and the waters around the peninsula are all used by Petersburg residents for trapping, shellfish gathering, and fishing. Most plant harvesting by Petersburg residents is done on Mitkof Island.

Wrangell residents historically used the Lindenberg Peninsula for deer hunting, though they are not documented as covering the peninsula interior as thoroughly as the Petersburg residents (Cohen, 1989). Instead they hunted the Lindenberg beach fringe and the immediately adjacent uplands. Wrangell residents use Duncan Canal extensively for hunting marine mammals, shellfish, and waterfowl. They also used Wrangell Narrows for salmon and halibut fishing. Maps produced by ADF&G show that Kake hunters historically used the lower reaches of Petersburg Creek and some of the beach fringe in Wrangell Narrows to hunt for deer (Firman and Bosworth, 1990), but these areas are not mapped on the TRUCS GIS coverages (TRUCS, 1988). Kake subsistence users have historically taken fish and game from Keku Strait and the western side of Kupreanof Island, but do not often travel to the Lindenberg Peninsula to hunt or fish (Firman and Bosworth, 1990).

Scoping comments indicate that other local residents not sampled in the TRUCS subsistence studies, especially those living on the Lindenberg Peninsula, use the peninsula extensively for fishing, hunting, and gathering (Hyatt, 1994). These users are not mapped on the subsistence area maps.

Areas Most Often Used for Subsistence Activities

The most popular areas on the Lindenberg Peninsula for subsistence gathering are predictably the beach fringe along Wrangell Narrows, and to a lesser extent in Duncan Canal. Some deer hunting occurs in the interior of the peninsula, as explained in the previous section. Several streams on the peninsula, especially Petersburg Creek, Coho Creek, and Skogs Creek, are popular for freshwater fishing (Smythe, 1988). The upland areas of Coho Creek and Skogs Creek are actively used by peninsula residents for all subsistence activities, especially deer hunting, freshwater fishing, and berry and firewood gathering (Hyatt, 1994). In addition, Petersburg and other residents use the Tonka LTF to off-load all-terrain vehicles during the deer hunting season.

The southwest facing slopes of the Lindenberg Peninsula have some of the most valuable winter deer habitat on Kupreanof Island. This area is therefore important from a subsistence standpoint, although few hunters actively hunt there. ADF&G has set objectives for all of Lindenberg Peninsula that call for a deer population at the highest density that current 1991 habitat allows (ADF&G, 1991a). Strict adherence to this objective would effectively preclude any further timber harvest on the Lindenberg Peninsula.

Types and Amounts Of Resources Gathered

Subsistence resources most intensively gathered by communities near the Lindenberg Peninsula are deer, salmon, halibut, and shellfish (Figure 3-18 and Table 3-14).

Several points should be noted regarding the data in Table 3-14. First, data in Table 3-14 are for subsistence use as it was documented in the TRUCS survey. While the TRUCS survey produced statistically significant and useful information and remains the accepted source for subsistence data in Southeast Alaska, it was a random survey and did not document all subsistence gathering activities in the study area. Second, only Petersburg and Wrangell are documented as harvesting significant amounts of fish and game from the South Lindenberg study area. Although the communities of Point Baker, Port Protection, and Kake harvest substantial amounts of subsistence resources, their use of the South Lindenberg area is low or negligible. Third, many of the fish and shellfish used by subsistence households, especially salmon and halibut, were actually caught with commercial fishing gear owned by the subsistence fishermen. Fourth, moose and deer seasons have recently been opened and expanded on Kupreanof Island. It is expected that current moose harvests are higher than those recorded by TRUCS.

Community Subsistence Profiles

Petersburg

Petersburg is situated on the northwest shore of Mitkof Island at the north end of Wrangell Narrows, approximately ten miles from the South Lindenberg study area. Per capita income

Figure 3-17. Subsistence Deer Hunting Areas in the Vicinity of South Lindenberg

LEGEND

- Study Area Boundary
- Existing Roads
- Proposed Roads
- Streams
- Proposed Units
- Petersburg Deer Hunting
- Wrangell Deer Hunting
- Existing Managed Stands
- Non-National Forest

SCALE 1 : 82,000

0 1 2 3 Kilometers

0 1 2 3 Miles

Source: Tongass Resource Use Cooperative Survey (TRUCS) 1988.

of Petersburg residents in 1987 was reported as $12,602 (Kruse and Frazier, 1988). Approximately 14 percent of the population is Native Americans (ADF&G, 1989).

Prior to white settlement, the Petersburg area was used for seasonal fishing camps by Native Americans. Founded by Norwegian Peter Buschmann in 1899, Petersburg was incorporated in 1906. More Norwegians followed and created a Scandinavian-style community. Petersburg grew around a cannery, and the site quickly became a center for fishing, fish processing, and transportation. Except for a slight decline in the 1950s, a continual growth in population has occurred since its beginning. The 1990 census population of Petersburg was 3,207 persons.

Petersburg's main economic sector was until very recently seafood harvesting and processing. A number of fish, shrimp, and crab canneries have operated in Petersburg and Scow Bay over the years. By 1989 Petersburg was port to the largest salmon purse seining fleet in Southeast Alaska. Halibut has also been central to the local fishing industry because it provided regular employment through the winter months. Approximately 37 percent of the households fished commercially in 1987, and 12 percent of all fish used by households was retained from commercial catches (ADF&G, 1992a).

Figure 3-18
Subsistence Resources Gathered by Petersburg and Wrangell Residents

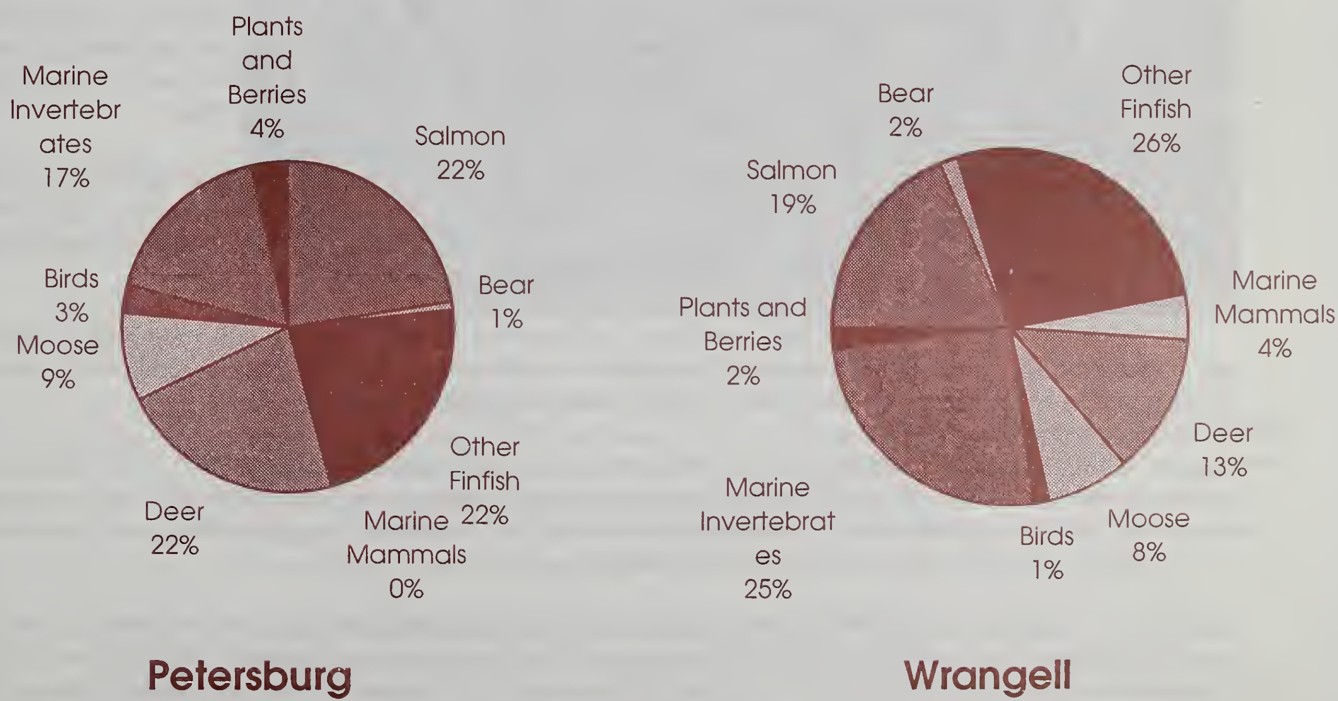


Table 3-14
Subsistence Resource Use by Study Area Communities

Resource	Pounds per Household Petersburg	Pounds per Household Wrangell
All Resources	666.85	460.34
Fish	300.16	205.61
Salmon	150.82	84.67
Other Finfish	149.34	120.94
Game	209.29	104.72
Deer	146.26	57.26
Bear	4.65	8.32
Moose	58.37	34.63
Marine Mammals	0.00	19.61
Birds	18.43	6.28
Marine Invertebrates	114.94	115.18
Plants and Berries	24.04	8.95

Source: ADF&G, 1992a

Government employment in Petersburg accounted for 35 percent of the wage income in 1986. The government sector has been declining through the late 1980s and early 1990s. Other economic sectors include retail trade, construction, timber, and tourism. Large scale logging was introduced to the area in the 1960s (ADF&G, 1992a).

The subsistence resources most commonly used by Petersburg residents are coho and chinook salmon, halibut, and deer (Figure 3-18). Crab, shrimp, berries, and wood are also important. Subsistence harvest provides just over 30 percent of the meat and fish for Petersburg residents (Kruse and Muth, 1990).

Harvest of land mammals by Petersburg residents consists primarily of deer, which are accessed mostly by boat and foot. Where logging roads are present, hunters often use all-terrain vehicles or hike on roads (ADF&G, 1992a).

Kupreanof Island was closed for deer hunting from 1975 to 1990. ADF&G data for 1987–1990 shows that most of the Petersburg deer hunters traveled south to Admiralty Island. During that same period, Petersburg hunters also harvested deer from areas on the mainland close to Petersburg.

ADF&G hunter statistics for 1993, when Kupreanof Island was re-opened to deer hunting, show that 187 deer were taken from the Lindenberg Peninsula, Mitkof Island, Woewodski Island, and Butterworth Island (the permit hunt area). The 1993 statistics do not distinguish precisely where these deer were taken or the residence community of the hunters.

The 1987–1990 TRUCS data indicate that Petersburg residents traditionally fish the waters of Wrangell Narrows, Duncan Canal, and the estuaries and lower streams of Kupreanof Island. King salmon fishing activity near the study area occurs primarily in Wrangell Narrows south to Beecher Pass; coho fishing is active at Blind Slough, Petersburg Creek,

and Duncan Canal. Review comments on the TRUCS maps mention that fishing is increasingly popular on lower Wrangell Narrows between Mitkof and Woewodski islands (ADF&G, 1992a).

Large portions of Duncan Canal are used extensively by the residents of Petersburg for the harvest of both marine invertebrates and waterfowl. Duncan Canal is also used for salmon, halibut, and other fishing.

Wrangell

Wrangell is located approximately 33 air-miles south of Petersburg on the northern tip of Wrangell Island. It is approximately 30 miles from the South Lindenberg study area. The 1990 population was reported at 2,479 persons. Approximately 38 percent of the population is Native Alaskan. Per capita income of Wrangell residents in 1987 was reported at $11,989.

Checking crab pots on Duncan Canal

Wrangell began as an important Tlingit village primarily because of its proximity to the Stikine River. Wrangell Stikine Kwan clans held and fiercely defended a monopoly of trading rights along the Stikine River, which served as an important early trade route into the Canadian interior. The flags of three nations (England, Russia, and the United States) have flown over Wrangell. Wrangell became a supply center for gold miners and prospectors during a gold rush in 1862 and in the Klondike rush of the 1890s. Over the years several fish, crab, and shrimp canneries have operated near Wrangell (ADF&G, 1992a).

Today, timber, fishing, and fish processing dominate Wrangell's economy. The fishing sector continues to pay well. Approximately 19 percent of Wrangell households fished commercially in 1987. Commercial fishing contributes significantly to the subsistence fish harvest because commercial fishermen generally have the skills and equipment to be successful in subsistence harvests. Also, deer are often hunted in areas remote from Wrangell and not accessible by small boats or skiffs. Hunting is sometimes accomplished during slack periods of the commercial fishing season. In Wrangell approximately 16 percent of all fish used by households in 1987 was retained from commercial catches (ADF&G, 1992a).

Timber eventually grew to surpass fishing in Wrangell's economic history, and by 1987 government was the third major employer after timber and fishing (ADF&G, 1992a). Wrangell is now one of the four principal shipping points for timber products in Southeast Alaska. Wrangell has a full-time U.S customs agent to handle international trade. Tourism has been a growing economic sector in recent years. More than 18,000 tourists visited Wrangell in 1987.

Wrangell residents hunt deer, bear, moose, and waterfowl; fish for salmon, halibut, and other finfish; and gather shellfish and berries (Table 3-14). Wrangell residents obtain approximately 23 percent of their meat and fish from subsistence activities (Kruse and Muth, 1990).

Harvest data from ADF&G indicate that the majority of Wrangell residents harvest deer on the north end of Prince of Wales Island, on Wrangell Island, on the small islands between Wrangell and Mitkof Island. Some Wrangell hunters reported historic use of the South Lindenberg area for deer harvest (Paul, 1993). TRUCS maps show extensive use of Duncan Canal for seal hunting, bird hunting, and shellfish gathering.

Recreation Resources

The natural attractions and extensive outdoor recreation opportunities of Southeast Alaska are among the leading reasons individuals choose to visit and live in the region (State of Alaska, 1993). Pristine natural features such as glaciers, wetlands, streams, and forests, located in a marine setting, provide numerous recreation opportunities for visitors and local residents alike. The popularity of these activities has made recreation and tourism the region's third largest industry (Morrow, 1994).

Its proximity to Petersburg makes the South Lindenberg area an important recreation destination. A primary recreation objective of the Forest Service is to provide for a broad range of outdoor recreation opportunities, as defined by the Recreation Opportunity Spectrum (ROS) (USDA Forest Service, 1982) and established in the Draft Forest Plan Revision (USDA Forest Service, 1991b).

Analysis of existing recreation opportunities is based on an evaluation of the existing setting by using ROS and the Recreation Places and Sites Inventory. Key setting characteristics considered in determining ROS class include remoteness, size of the area, evidence of humans and human activity, user density, and design of facilities. The setting reflects the amount and kind of activities that occur in an area. ROS allows for regional or area-wide planning to occur, whereas the Recreation Places and Sites Inventory allows for planning and management of specific recreation locations.

Access

Primary access to the Lindenberg shoreline is by watercraft. Inland areas are reached by helicopter, foot, and to a limited extent, vehicles. The area is partially roaded with 56 miles of dirt and gravel roads from previous timber sales. The only vehicle access to the road system is by barging to the Tonka LTF, approximately 6 miles south of Petersburg.

The Green Rocks Trail is the only official Forest Service hiking trail located in the study area. It provides access to Green Rocks Lake at the end of a one-mile hike. The Duncan Canal Portage Trail, no longer maintained by the Forest Service nor listed as an official trail, is a primitive trail that runs from Wrangell Narrows to Duncan Canal at Ohmer Slough.

Recreation Opportunities

The ROS approach provides a framework for stratifying and defining classes of outdoor recreation environments that offer different recreational opportunities and experiences (USDA Forest Service, 1982). Opportunities are arranged along a spectrum from primitive to urban and are evaluated based on the setting in which they occur. Settings are characterized by physical, social, and managerial attributes. Physical attributes refer to an

area's size and evidence of human activity. Social attributes refer to user density, and managerial attributes refer to the level of regimentation or control that is present. The analysis of an area allows the Forest Service to assess the demand for various opportunities and to respond by modifying the setting to adjust the supply to the demand.

Of the eight ROS classes recognized for the Tongass National Forest, Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Modified (RM), Roaded Natural (RN), and Rural exist in the South Lindenberg area (Table 3-15). The distribution of these five ROS classes is presented in Figure 3-19.

Large portions of the South Lindenberg area maintain ROS classifications of SPNM and SPM (Figure 3-19). The SPNM areas offer a high probability of experiencing solitude, self-reliance, and isolation from the sights and sounds of humans, in a predominantly natural environment. Currently, no motorized use occurs within these areas. The central portion of the study area is roaded from previous timber sales and is classified as RM. The roaded areas offer opportunities for both non-motorized and motorized forms of recreation. The coastal portions of the South Lindenberg Peninsula along Duncan Canal and Wrangell Narrows maintain an ROS classification of SPM. Although these areas offer a predominately natural environment, motorized use is compatible with this ROS setting. Motor boats are common in the waterways of the area particularly for fishing (both recreational and commercial), waterfowl hunting, and sightseeing. The rural designations along the eastern shoreline represent homesites on private land. An area with ROS classification of RN occurs on state and private land in the southern portion of the Lindenberg Peninsula near Beecher Pass.

Table 3-15
Recreation Opportunity Spectrum Classes in the South Lindenberg Area

ROS Class	Acres	(%)
Semi-Primitive Non-Motorized (SPNM)	22,772	(39)
Semi-Primitive Motorized (SPM)	11,363	(19)
Roaded Natural[1]	0	(0)
Roaded Modified (RM)	24,182	(41)
Rural	27	(<1)

[1]Located only on state and private land

Recreation Places And Sites

"Recreation places" represent specific geographic areas used for recreation. "Recreation sites" generally refer to specific points like anchorages or developed facilities, such as recreation cabins and trailheads. The Forest Service has identified 96 existing recreation places and sites in the vicinity of Kupreanof Island, including 20 recreation cabins. Recreation cabins located less than 5 miles from the South Lindenberg area include Petersburg Lake, Castle Flats, Castle River, Breiland Slough, Salt Chuck East, Harvey Lake, and Beecher Pass.

Within and adjacent to the study area, 21 recreation places and sites have been identified. Recreation places within the South Lindenberg area include Green Rocks Lake, Green Rocks Trail, an old Civilian Conservation Corps shelter at Warm Fish Lake, and a fishing access trail along Mitchell Slough. The recreation sites in the South Lindenberg area: are Green Rocks Trailhead on Island Point, and an anchorage and three private cabins under special-use permit along Ohmer Slough (Figure 3-19). The area also includes Mitchell Creek, Duncan Creek, Colorado Creek, and Coho Creek. These streams provide habitat for fish and wildlife populations that support sport fishing, hunting, and subsistence use by residents both within and outside the boundaries of the area.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act of 1968 established a method of providing protection for selected rivers of the United States which possess certain "outstandingly remarkable" values. The Act created the National Wild and Scenic River System and outlined the process by which additional rivers or portions of rivers could be added to the system. There are currently no designated Wild and Scenic Rivers in the South Lindenberg study area.

In developing the Tongass Land Management Plan Revision, all rivers were evaluated for their eligibility into the Wild and Scenic River System. Determination of eligibility was based on a river possessing one or more "outstandingly remarkable" scenic, recreational, geologic, wildlife, fisheries, historic, cultural, or other values of significance to the geographic area of the province. In addition, the river's free-flowing characteristics, length of flow, and water quality were also considered.

No rivers in the project area were found eligible for the Wild and Scenic River System during the Forest planning process. Several rivers outside the South Lindenberg study area however are being considered as possible candidates for addition into the system. These include: Blind River, Castle River, Kah Sheets Creek, and Petersburg Creek.

Recreation Activities

Southeast Alaska has several unique features that characterize recreation settings and opportunities in the region, including the South Lindenberg area. The marine environment with its extensive network of fjords, islands, and waterways sets the region apart from much of the rest of the state. Travel in the area is oriented to water, rather than to land, which indicates the importance of boating to local populations and tourists alike. The 1,000 mile long "Inside Passage" provides individuals a relatively sheltered travel zone for viewing the many outstanding natural features of the area (USDA Forest Service, 1978). Much of this tourist travel is on cruise ships. Almost half of all the visitors to Alaska in 1993 visited the Inside Passage, making it the most-visited attraction (State of Alaska, 1993).

State-owned ferries serve numerous ports including Petersburg. Tour boats, yachts, small charters, and kayaks are examples of additional craft which visitors utilize in the waterways of the region and around the study area. These major waterways include Duncan Canal and Wrangell Narrows, a 21 mile long section of the Alaska Marine Highway.

The landscape in the area is characterized by vast areas of remote land, much of it untouched by human activity. Primary attractions of Kupreanof Island and its surrounding waters are the natural beauty and the opportunities to participate in dispersed forms of recreation. Miles of stream and shoreline, coniferous forests, and alpine peaks provide a variety of opportunities for subsistence use such as fishing, hunting, and berry-picking, in addition to recreational camping, hiking, picnicking and sightseeing. Specific features that support recreation and attract visitors include the Petersburg Creek-Duncan Salt Chuck Wilderness; Petersburg Creek, Lake, and Trail; Duncan Canal; Wrangell Narrows; and Beecher Pass.

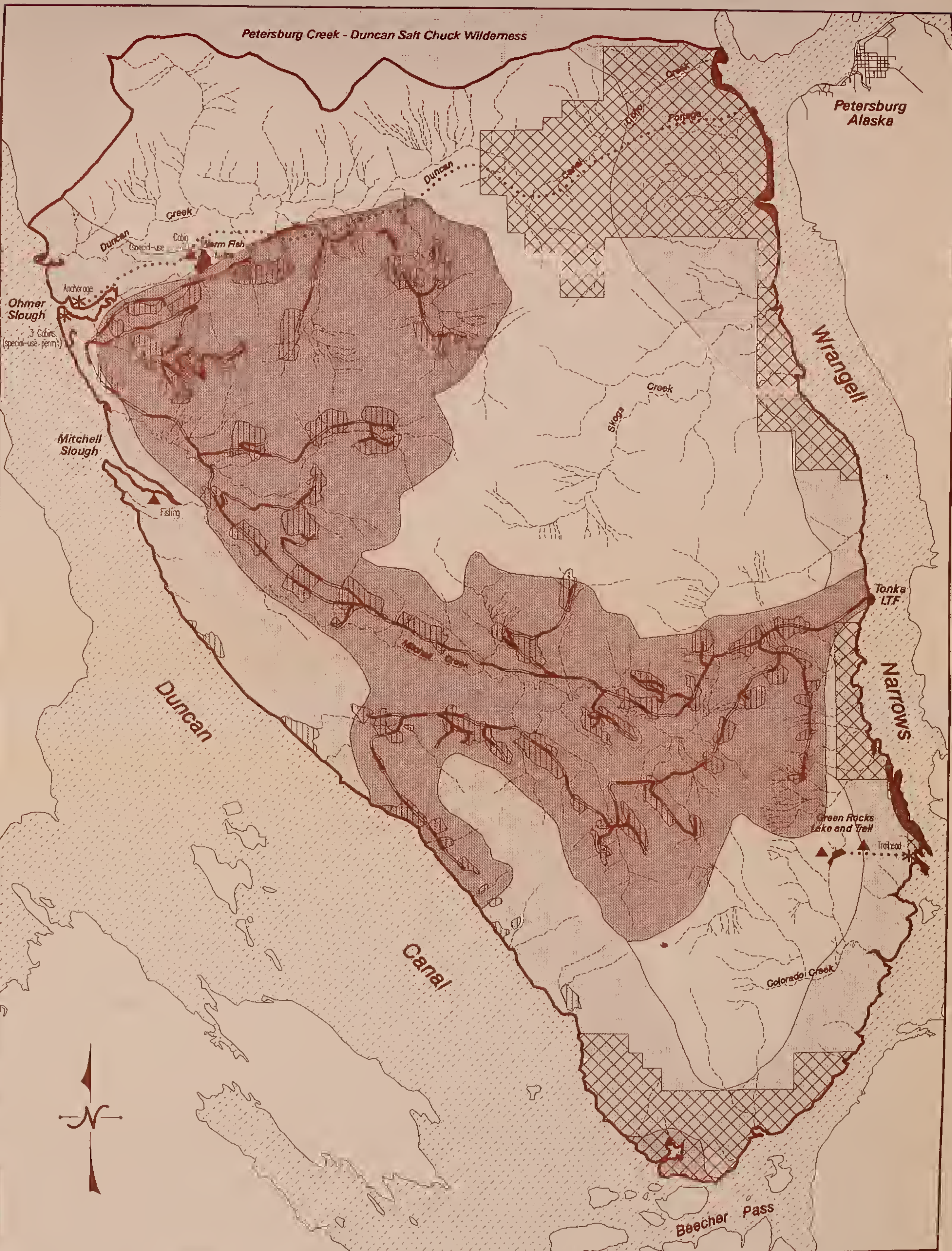


Figure 3-19. ROS Designations and Recreation Areas in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- Trails
- Semi-Primitive Non-Motorized (SPNM)
- Semi-Primitive Motorized (SPM)
- Roaded Natural (RN)
- Roaded Modified (RM)
- Rural
- Recreation Place
- Recreation Site

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Commercial recreation activities occur on Kupreanof Island and in the waters surrounding the South Lindenberg Peninsula. These uses include fishing, guided big game hunting (particularly deer and black bear), tour boats, small carters, and sea kayak trips. Commercial sport fishing outfitters typically utilize areas close to the study area, but most of the area's anglers are self-supported. Outfitter guides may provide transportation of visitors and local residents to the Lindenberg Peninsula road access point at the Tonka LTF for individuals who choose to use the road system for activities such as all terrain vehicle or mountain bike use, hiking or camping. Charter boat operators occasionally bring visitors to and from recreation cabins in the area.

The roadless character of much of the South Lindenberg area is an important facet of the environment, and the semi-primitive recreational opportunities that it provides are fairly common in the region. The Tongass National Forest as a whole is 91 percent roadless, and the Stikine Area maintains 40 roadless areas, totaling more than 2.4 million acres.

Recreational visitors to Southeast Alaska typically use the state-owned ferry system

All areas within the Tongass National Forest that are in an unroaded and essentially undeveloped condition, but not currently designated as "Wilderness," were inventoried by the Forest Service and evaluated for their wilderness potential. Roadless Areas identified in the inventory may be considered for wilderness recommendation or may be managed for a wide range of other resource management activities. Forest Plan direction allows roading and harvest units within inventoried Roadless Areas. Each inventoried Roadless Area was identified with a name and an inventory number. The Roadless Areas in the South Lindenberg area are designated as the "Lindenberg Roadless Area" (No. 216) and the "Green Rocks Roadless Area" (No. 217). The Lindenberg Roadless Area encompasses 22,437 National Forest acres and is in the north and northeast section of the study area. The area is adjacent to state land and is essentially unmodified. It primarily offers semi-primitive opportunities in natural, unroaded settings, although some forms of traditional, motorized access are allowed (mainly by air or water). The Green Rocks Roadless Area is in the

southern portion of the study area and is 10,360 National Forest acres. The area is unmodified except for a very limited area with existing recreation cabins, residences, and trails. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities.

Visual Resources

Landscape Character

The scenic resources of the South Lindenberg area are important to the nature-based tourism of Southeast Alaska, and more importantly to communities like Petersburg and Wrangell around the study area. Ferry and cruise ship travel as well as local recreational tourism (fishing, kayaking, hiking) are important economic industries that depend on a landscape of high visual quality.

The Lindenberg Peninsula is part of the physiographic region that is classified by the Forest Service as the Kupreanof Lowlands (Visual Character Types, USDA Forest Service, 1979b). This region extends from Frederick Sound at the northern end of Kupreanof Island, to the middle of Prince of Wales Island to the south, and from the Gulf of Alaska to the Wrangell Narrows which defines the eastern border of the study area.

The Kupreanof Lowlands consist of numerous small and a few large islands (Kupreanof, Prince of Wales, and Baranof) that are characterized by rolling terrain that ranges in elevation from 300–1,500 feet. Occasionally there are mountain peaks over 3,000 feet such as Duncan Peak (3,249 ft msl) and Five Finger Mountain (3,020 ft msl) in the study area. The rolling terrain of the Lowlands is dissected by an intricate network of relatively short waterways, including Coho, Colorado, and Duncan creeks in the South Lindenberg area. Most of the terrain in the Lowlands is dominated by spruce and hemlock forest, except for the low lying areas where muskeg and shore pines dominate, and at the higher elevations (over 1,500 feet) where muskeg and sheer rock faces prevail.

Seen Areas

The southern Lindenberg Peninsula is seen from a variety of locations and by a wide range of viewers. The vast majority of viewing occurs from outside the study area. Included are saltwater travel routes that surround the southern Lindenberg Peninsula, adjacent islands of Mitkof and Woewodski, and the western peninsula of Kupreanof Island. Views into the study area from these off-site locations are generally confined to the upper portions of the outwardly-facing slopes and ridges of the peninsula, and to the immediate shoreline. Tall coniferous forest along the peninsula shoreline screen much of the flatlands and lower slopes. Locations from which the study area can be seen are categorized into three different viewsheds: Wrangell Narrows, South Peninsula, and Duncan Canal.

The primary viewing areas, or viewsheds, for the South Lindenberg study area are: the Wrangell Narrows, South Peninsula, and Duncan Canal. Small boats may be present in any of the viewsheds. Tour ships and state ferries pass through the Wrangell Narrows and passengers can see in detail the project area. Views from air routes are not a priority in the visual resource evaluation, because large commercial jets typically do not fly directly over the study area, and small planes fly over the study area on a sporadic basis in shifting traffic patterns.

Southeast Alaska has a Pacific Maritime climate that is characterized by relatively moderate temperatures with high levels of rainfall. The region is obscured by clouds part of the time, which can limit views of the study area.

Wrangell Narrows Viewshed

The Wrangell Narrows viewshed is defined as the land area and saltwater that can be seen from Wrangell Narrows between the town of Petersburg and Woewodski Island (approximately 12 linear miles). This includes the west edge of Mitkof Island, from Petersburg south to Blind Slough, the northwest portion of Mitkof Island west of Blind Slough, and the east side of the southern Lindenberg Peninsula (VCU 447) which includes Skogs and Colorado creek drainages.

The Wrangell Narrows viewshed is the most densely populated and highly visited of the three viewsheds. It includes the town of Petersburg, Scow Bay, and the boat accessible shoreline community of Kupreanof, and other dispersed shoreline homesites. Petersburg is a regional commercial and industrial center that supports commercial fishing, tourism, and adventure travel. It is serviced by a private and commercial airport and is a port-of-call for small tour ships and Alaska ferries travelling the Inside Passage.

In 1989 more than a half million people visited southeast Alaska's Inside Passage. The majority of these visitors (343,100) travelled on Alaska ferries, the remainder (193,983), on commercial cruiseships. The scenery of the Tongass National Forest is advertised and promoted by the Division of Tourism, cruiseship operators, and the Alaska Tourism Council as a major attraction of the Inside Passage (USDA Forest Service, 1991b).

The two major transportation routes in this viewshed are Mitkof Highway and the Wrangell Narrows boat channel. Mitkof Highway is the only paved road in the three viewshed area. It runs along the western edge of Mitkof Island and is used by residents traveling to and from Petersburg as well as recreationists accessing developed recreation sites such as Ohmer Creek Campground, Papke's Landing boat launch ramp, and Blind Slough Picnic Area. Wrangell Narrows is a major boat channel that is part of the Inside Passage. The channel is used by medium-sized commercial boats, commercial and private cruiseships, Alaska ferries, commercial fishing boats, recreation- and subsistence-related boat traffic, and as a transportation corridor for local residents. Developed recreation sites within the Wrangell Narrows viewshed include Papke's Landing Boat Launch and Raven's Roost Cabin on Mitkof Island (Figures 3-20 through 3-22).

People view the Wrangell Narrows viewshed most often from land and water locations, but also from the air. Types of viewers include local residents, tourists, recreationists, commercial fishermen, and subsistence users. Most experience fore and middleground views of the study area.

South Peninsula Viewshed

The South Peninsula viewshed is the area between Wrangell Narrows and Duncan Canal. This includes Beecher Pass and Keene Channel (including the north side of Keene, Saltery, Fair, Pearl, Blowdown, and Jewell islands), the north edge of Woewodski Island, and the south end of Lindenberg Peninsula (VCU 448). This 5 mile section of water is difficult to navigate and therefore boat traffic is typically limited to small craft and small tour boats. The island shorelines are moderately populated with homesites, and there is one recreation place, the Beecher Pass Forest Service Cabin. The area is used primarily as a thoroughfare for boat travel. There are no roads in the viewshed, therefore viewing locations are confined to the water and immediate shoreline (Figure 3-23).

People view the South Peninsula viewshed most often from water locations. The number of viewers is significantly less than the Wrangell Narrows viewshed, but slightly more than the Duncan Canal viewshed. Types of viewers include residents of shoreline homesites, recreationists, subsistence users, and commercial fishers. Most views of the viewshed are from 0.5 to 3 miles away (middleground distance zone).

Duncan Canal Viewshed

The Duncan Canal viewshed is defined as the land area and saltwater that can be seen from Duncan Canal, extending from Tower, North, and McDonald Arms south to Beecher Pass. It includes the eastern edge of Kupreanof Island and the west side of the South Lindenberg area (VCUs 437 and 439), including Duncan and Mitchell Creek drainages (Figure 3-24).

Duncan Canal is much more remote than the Wrangell Narrows or the South Peninsula viewsheds. It is approximately 20 boat-miles from Petersburg. The remoteness of the canal makes it a popular recreation destination for local residents and adventure travelers. It is also used for commercial fishing and subsistence hunting and fishing. There are four Forest Service recreation cabins in the canal that are available for public use (Tower Arms, Castle Flats, Castle River, and Breiland Slough).

Boat travel is the primary means of accessing the Duncan Canal viewshed. The only roads in the viewshed are Forest Service Road 6350 and associated spur roads. These roads are open to public use, but, vehicles must be barged to the island. FS Road 6350 begins at the Tonka LTF and extends west through the Mitchell Creek drainage, then north to the Duncan Creek drainage. It provides vehicular access to the northeast portion of the viewshed, including the Duncan Mountain communication site and Duncan Creek areas.

Duncan Canal receives the fewest number of viewers of the three viewsheds. Types of viewers include commercial fishers, local and visiting recreationists, and subsistence users. Most people view the area from the saltwater. Charter aircraft occasionally fly anglers through the northern portion of the viewshed (Duncan Creek) to access remote lakes and rivers in the area. Views of the study area are typically 3 to 5 miles away (middle and background distance zones).

Visual Management System

The Forest Service considers the visual environment as a basic resource of National Forest Lands. It receives equal consideration with other basic resources such as soil, wildlife, and water. To manage this basic resource, the Forest Service has developed the Visual Management System (VMS) which is a methodology for: (1) inventorying the visual resource; (2) establishing management objectives for the visual resource, and; (3) assessing visual impacts associated with proposed actions. Assumptions inherent in this methodology are:

- any visual change resulting from timber harvest activities will create an impact;
- a landscape viewed by many people is more sensitive than a landscape viewed by a few,
- that a unique or aesthetically high-quality landscape is more sensitive than a regionally common landscape, whether or not it is viewed by many people,
- the definition of an aesthetically high-quality landscape is subjective, and
- for this study, an aesthetically high-quality landscape is pleasing or dramatic, memorable, and distinguishable from surrounding landscapes.

View west from Mitkof Highway at the south end of Petersburg, looking across the Narrows to the Coho Creek (right), and Skogs Creek drainages (far left)

View west from the Beachcomber Inn pier; looking across the Narrows to the Skogs Creek drainage

Figure 3-20 Views of the study Area

View west from Raven's Roost Cabin, looking across the Narrows to the Skogs Creek drainage

Figure 3-21. Views of the Study Area

View west from Papke's Landing pier, looking across the Narrows to the unnamed ridge with existing harvest units

View west from the mouth of Blind Slough, looking across the Narrows to the Colorado Creek drainage

Figure 3-22. Views of the Study Area

View northwest from the southern end of Wrangell Narrows, looking across the Narrows to the southern end of the Study Area

View north from Beecher Cabin, looking across Duncan Canal to the southern end of the Study Area

Figure 3-23. View of the Study Area

View east from Brieland Slough Cabin, looking across Duncan Canal to existing harvest units in the Study Area.

View east from Indian Point, looking across Duncan Canal to the Duncan Creek drainage

Figure 3-24 Views of the Study Area

Existing Visual Condition (EVC)

The first step of VMS is to inventory the existing visual condition (EVC). The study area landscape ranges from natural to heavily altered. Areas that have been recently harvested and are not greened up, such as Mitchell Creek drainage and the southern portion of Duncan Creek drainage, are landscapes that have been heavily altered. Other older harvested areas that have greened up are landscapes that are moderately altered, and include the unnamed drainage between Duncan and Mitchell creeks, the ridge facing Duncan Canal south of Mitchell Creek, and a small area between two unnamed drainages south of Mountain Peak on the Wrangell Narrows side of the island. Other naturally appearing and slightly altered landscapes include areas that were harvested more than 20 years ago and are not only greened up, but are not readily noticeable when viewed from saltwater travel routes. The remainder of the study area is in a natural condition.

Using the EVC as the baseline condition, the study area is inventoried to establish visual quality objectives for future management. Three landscape characteristics are mapped and rated in the inventory: landscape variety, sensitivity level, and distance zone, each of which is briefly described below.

Landscape Variety Classes—The relative classification of the landscape into areas of importance from a scenic quality perspective yield landscape variety classes. The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value. Over 60 percent of the South Lindenberg area is rated as common, which includes the ridges of Duncan, Skogs, Mitchell, and Colorado creek drainages. Approximately one-third of the study area exhibits minimal landscape variety, consisting of the flat or gently rolling valley floors of these same drainages. The high rugged slopes around Duncan Peak in the center of the study area and the southeast shoreline are rated as distinctive and represent 5 percent of the study area.

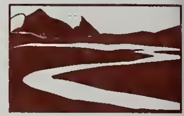
Sensitivity Levels—These are an indication of people's concern for the scenic quality of the landscape. They are based on the amount of use an area receives and type of user. Primary travel routes and recreation places where visitors are anticipated to have a high concern for visual quality are designated high visual sensitivity. Areas that are not heavily used and where users are less concerned with visual quality (because of their commodity orientation to the landscape) are designated as either medium or low visual sensitivity. In the South Lindenberg area there are predominantly high and low sensitivity levels. Over half of the study area, is seen from Wrangell Narrows or Duncan Canal and is designated as high visual sensitivity. Most of the remaining area is not seen from either Wrangell Narrows or Duncan canal and has a low sensitivity. The other 1 percent of the area is moderate sensitivity and encompasses primarily high knolls that are seen in the background (over 5 miles) from saltwater travel routes.

Distance Zones—The seen areas such as Wrangell Narrows or Duncan Canal are divided into foreground, middleground, and background distance zones. The distance from which a landscape is most commonly viewed determines distance zone. The foreground distance zone is defined as the landscape within 0.5 miles of the observer, the middleground as the landscape from 0.5 to 5 miles from the observer, and the background as 5 miles to infinity. Slightly more than half of the study area is either not seen or seen as background from Wrangell Narrows or Duncan Canal. More than a third is seen in the middleground distance zone from saltwater travel routes. The shoreline of coniferous forest that encircles the Lindenberg Peninsula defines the foreground distance zone and makes up 11 percent of the study area.

Visual Quality Objectives

From the landscape inventory, five possible visual quality objectives (VQOs) are established that allow for varying degrees of acceptable landscape modification.

Preservation (P)—This visual quality objective allows ecological changes only. Management activities, except for very low visual-impact recreation facilities, are prohibited. This objective applies to wilderness areas, primitive areas, other specially classified areas, areas awaiting classification, and some unique management units that do not justify special classification. There are no areas of preservation in the study area.



Retention (R)—This visual quality objective provides for management activities which are not visually evident. Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident.

Partial Retention (PR)—Management activities remain visually subordinate to the characteristic landscape when managed according to the PR objective. Activities may repeat form, line, color, or texture that are found infrequently or not at all in the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape.

Modification (M)—Under the M objective, management activities may visually dominate the original characteristic landscape. Activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area character type.

Maximum Modification (MM)—Management activities of vegetative and landform alterations may dominate the characteristic landscape under the MM objective. When viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail that is incongruent with natural occurrences as seen in foreground or middle ground.

Inventory VQOs

The Forest Service further classifies VQOs into "inventoried" (IVQOs) and "adopted" (VQOs). The IVQOs represent objectives for the visual resource based on the landscape characteristics and do not take into account other resource or management considerations. The IVQOs are often modified in the Forest Plan to accommodate other resource or management objectives. When this is done they are referred to as the "adopted VQOs" or simply as "VQOs" once a plan has been approved.

Both IVQOs, and the VQOs proposed in the Draft Forest Plan Revision (USDA Forest Service, 1991b) (referred to from now on as the Revised TLMP VQOs) were considered in the planning and analysis of the South Lindenberg Timber Sale. IVQOs place equal importance (equally restrictive VQOs) on the visual quality of the study area seen from Duncan Canal as well as from the Wrangell Narrows. The Revised TLMP VQOs place more importance (are more restrictive) on the visual quality of the study area seen from the Wrangell Narrows than on the area seen from Duncan Canal. Below is a description of the IVQOs and Revised TLMP VQOs.

Based on IVQOs, over 40 percent of the South Lindenberg area is to meet a PR objective. These lands include primarily the middleground seen areas from Wrangell Narrows and

Duncan Canal. The inland valleys and slopes that are not seen from the saltwater routes have either a M objective (27 percent) or a MM objective (20 percent). The remaining landscape has a R objective and includes the high dramatic peaks above Skogs Creek and coastal shoreline areas (Figure 3-25).

Revised TLMP VQOs

Under the Revised TLMP VQOs, just under 40 percent of the study area is to meet a MM objective, including most of the landscape that is not seen from Duncan Canal. Areas of M encompass the landscape that can be seen from Duncan Canal and areas that are not seen from Wrangell Narrows. One-fourth of the area has a PR objective and includes the landscape seen from Wrangell Narrows and the shoreline along Duncan Canal. High peaks and shoreline areas along Wrangell Narrows again have an R objective (Figure 3-26).

Visual Absorption Capacity

Visual absorption capacity (VAC) is an estimate of the relative ability of a landscape to accept visual change associated with management activities. Landscapes are rated as having either a high, intermediate, or low ability to accept visual modification based on such factors as slope, aspect, landscape complexity, and the distance from which an area is viewed. Half of the South Lindenberg landscape has a high capacity to absorb change, and the other half an intermediate capacity. Less than 1 percent of the study area has a low VAC. Areas of high VAC include most of the inland landscape that is not easily seen from saltwater travel routes. Conversely, areas of intermediate VAC include the areas that are seen (Figure 3-26).

Combining VQO and VAC ratings gives an indication of the relative ease or difficulty that may be required to meet VQOs. VQO/VAC combinations may also indicate the type of harvest techniques to be used, and the extent of landscape architectural input required to meet VQOs. Typically, areas of intermediate and high VAC with VQOs of modification and maximum modification accept traditional timber harvest activities, such as clear cutting, with limited landscape architectural input. Areas of low and intermediate VAC, with VQOs of retention and partial retention, typically require more landscape architectural input and may include less traditional harvesting techniques such as shovel and helicopter logging.

When IVQOs are combined with VACs, over 40 percent of the South Lindenberg area has a PR VQO-intermediate VAC rating (Figures 3-26,-27). Areas of MM VQO—high VAC and M VQO—high VAC ratings each compose at least 20 percent of the area. Combining Revised TLMP VQOs with VACs produces a MM VQO—high VAC rating for almost 40 percent of the study area (Figures 3-27). Areas with M VQO—intermediate VAC and PR VQO—intermediate VAC each compose about a fourth of the area. No other combinations exceeds 8 percent. Compared to the IVQO—VAC combinations, the Revised TLMP VQO—VAC ratings are quite similar in the eastern third of the South Lindenberg area (i.e., facing Wrangell Narrows), but exhibit predominantly MM VQO—high VAC and MVQO—intermediate VAC in the western two-thirds (Figures 3-26 to 3-28).

[illegible]

Figure 3-25. Inventory Visual Quality Objectives in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- VCU Boundaries
- Retention
- Partial Retention
- Modification
- Maximum Modification

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Affected Environment 3

Figure 3-26. 1991 TLMP Revision Visual Quality Objectives in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- Existing Managed Stands
- Non-National Forest
- VCU Boundaries
- Retention
- Partial Retention
- Modification
- Maximum Modification

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Figure 3-27. Inventory VQO-VAC Combination in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- VCU Boundaries
- Existing Managed Stands
- Non-National Forest
- Retention
- Partial Retention
- Modification
- Maximum Modification
- Low VAC
- Intermediate VAC
- High VAC

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

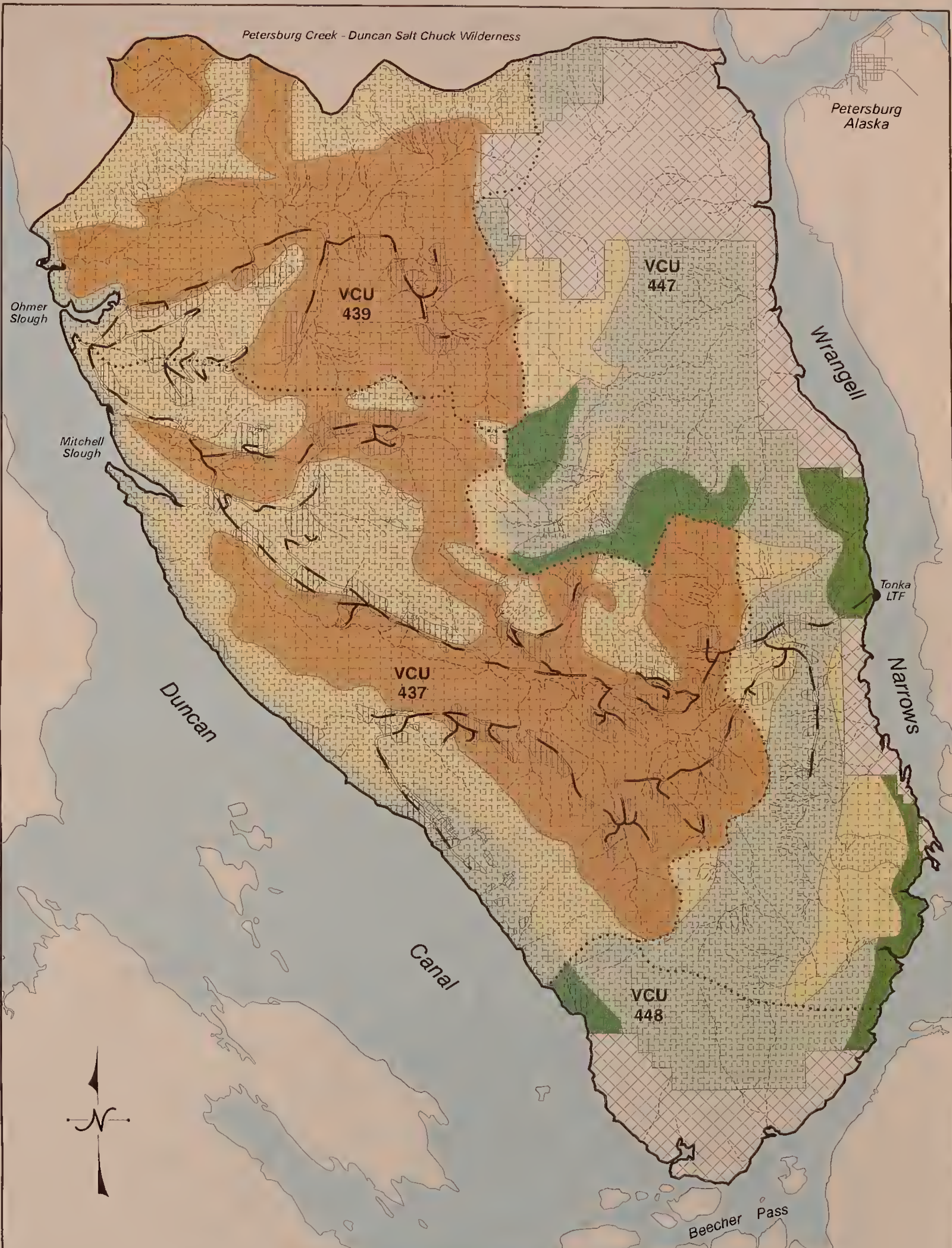


Figure 3-28. 1991 TLMP Revision VQO-VAC Combination in the South Lindenberg Area

LEGEND

- Study Area Boundary
- Existing Roads
- Streams
- VCU Boundaries
- Existing Managed Stands
- Non-National Forest
- Retention
- Partial Retention
- Modification
- Maximum Modification
- Low VAC
- Intermediate VAC
- High VAC

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

Cultural Resources

Archaeological studies, ethnographic and historic research, and oral testimony from knowledgeable Native and non-Native elders are the primary sources of information about the past cultural environment in Southeast Alaska. *A Cultural Resource Overview of the Tongass National Forest, Alaska* (Arndt et al., 1987) provides a general background for past human activity in the Kupreanof Island and nearby Mitkof Island vicinity and on the Lindenberg Peninsula in particular.

Past Cultural Environment

Southeast Alaska has been inhabited for at least 9,500 years, but no evidence that old has been found yet on Kupreanof or Mitkof Island. In the intertidal zone at the Sandy Beach Site just outside of Petersburg on Mitkof Island are petroglyphs (rock carvings) and several fish traps formed by long wood stake and stone leads funneling fish into heart-shaped pens. Radiocarbon dates indicate the traps were built about 2,000 years ago. On the west side of Kupreanof Island the Irish Creek site, although containing microblade cores and other stone tools more commonly thought to be much older, yielded a radiocarbon date of 2,200 years before present.

The people living at these two locales were likely ancestral to the Tlingit Indians encountered when European and American explorers ventured into Southeast Alaska in the late 1700s. Historic accounts about the Tlingit and later ethnographic descriptions by anthropologists explain something of the Native way of life. Extended families lived in large plank houses congregated at central villages. They often fanned-out to temporary amps to hunt, gather, and fish. Foods were obtained according to the seasons. Salmon fishing was especially important because dried salmon lasted during the lean months of winter and early spring. Large dugout canoes were used to transport people and food through the extensive marine waters of Southeast Alaska. Totem poles were carved to celebrate particular people and events. Huge potlatches cemented social relationships and established the rank of individuals within the society. Throughout Southeast Alaska, Native groups developed a complex and successful culture based on efficient use of the land and sea resources.

Traditionally, the Kake Tlingit owned the north and west part of Kupreanof Island, and the Stikine Tlingit owned the southeast part of Kupreanof Island and Mitkof Island. The Stikine Tlingit traditionally used the Lindenberg Peninsula for seasonal hunting and fishing. Although historic accounts suggest that smaller villages were once more numerous, by 1880 the Native occupation of Kupreanof Island was largely reduced to the main village of Kake (Petroff, 1884). When Norwegian Peter Buschmann began a salmon cannery and sawmill on Wrangell Narrows at what was to become Petersburg, Kake was a thriving Native community and one of the main Tlingit villages in Southeast Alaska. Non-Natives with ties to Petersburg and the nearby town of Wrangell on the mainland began drawing the Tlingit into a wage-based economy. At the same time, the non-Natives learned to use wild foods much as the Natives did. The people of Petersburg were also quick to develop commercial uses for Kupreanof Island's resources. Historic non-Native use included commercial logging, fishing, fur farming, and subsistence hunting. Demand for firewood and for lumber—both milled boards and logs for pilings—increased as people built houses, stores, docks, warehouses, salteries and canneries, and other facilities. A short-lived saltery was in operation between 1902–1905 on the Wrangell Narrows side of the Lindenberg Peninsula at a place called Tonka. During the following 2 decades prospecting and mining ventures sprang up at the head of Duncan Canal, and on Woewodski Island just south of Lindenberg Peninsula. Fur farming was commercially profitable in the 1920s and 1930s, and remote cabins and homesteads were established on small islands (under Forest Service permit) to service fox and mink-raising operations. Meanwhile, in the waters surrounding Kupreanof Island, ever-larger boats fished for salmon and halibut, then shrimp and crab, to create the present-day commercial fishing industry upon which most people in the region rely for their livelihood.

Cultural Resource Investigation

Prior to this EIS investigation, cultural resource inventory on the Lindenberg Peninsula consisted solely of several minor Forest Service reconnaissances. Six cultural sites had been confirmed and entered on the statewide Alaska Heritage Resource Inventory. These consisted of two log cabins, two archaeological sites containing raised furrows from old vegetable gardens (possibly prehistoric), the Tonka cannery, and a mountain-top WACS (White Alice) early-warning military radar installation. However, information gleaned from archival sources and local residents, suggested over two dozen more cultural sites of various types on the Lindenberg Peninsula.

Under the National Historic Preservation Act of 1966 and the National Environmental Policy Act (NEPA) of 1969, the Forest Service must take steps to minimize the risk that the South Lindenberg timber sale would disturb significant elements of cultural sites eligible to the National Register of Historic Places. A predictive model and inventory strategy for Forest Service lands in Alaska defines areas of high and low site probability. The model is derived from the known distribution of prehistoric and historic sites in the Tongass National Forest as recorded up to 1992. The high probability areas include all land between mean lower low water and the 100 foot elevation, and special areas including:

- mineralized zones;
- river valleys and lake and river systems providing passes or portages across larger land masses;
- lake and stream systems containing, or known to have contained, anadromous fish runs;
- elevated/fossil marine, riverine, and lacustrine terrace systems;
- areas of carbonate rock and certain igneous rock formations (for caves and rockshelters;
- areas associated in myths and legends; and
- potential raw materials sources (obsidian sources, exceptional concentrations of culturally modified trees, etc.).
- Everything else is considered part of the low probability zone.

On the Lindenberg Peninsula, exceptional areas (above the 100 foot contour) assigned to the high probability zone are the Duncan Canal Portage—an historic trail along Duncan and Coho creeks from Wrangell Narrows to Duncan Canal, and a trail between Wrangell Narrows and Green Rocks Lake. Other than two instances where proposed roads cross the Duncan Canal Portage, timber sale activities are not proposed in any high probability zone above the 100 foot contour. The Forest Service removed the Duncan Canal Portage segment from Wrangell Narrows to Warm Fish Lake from cultural resource consideration.

Results of the cultural resources inventory, which covered all direct impact areas below the 100 feet contour, included six newly documented cultural sites, 22 culturally modified trees, and oral accounts of historic land use. No cultural sites eligible to the National Register of Historic Places were discovered in the direct impact areas below the 100 foot contour. In addition to documenting the Warm Fish Lake cabin and the Tonka cannery, four intertidal fish trap sites and a petroglyph were recorded. The Sandburg petroglyph is an enigmatic feature on the shore of Duncan Canal. The McDonald Arm fish trap consisted of three separate weir structures, each leading to a heart-shaped trap; it yielded three radiocarbon dates 1,700 years old. The Woody Island fish trap consisted of at least two weir complexes,

with portions of several leads in evidence, and one intact heart-shaped trap. The latter yielded a date 1,300 years old, and a wooden stake from the second weir complex yielded a date 2,200 years old. Finally, from one of the few wooden stakes found at the Mitchell Slough fish weir, a radiocarbon date of 2,000 was obtained.

The four fish trap sites, Tonka saltery, and Warm Fish Lake cabin appear eligible to the National Register, while the features observed at the Sandburg petroglyph site are insufficient to warrant eligibility. The heart-shaped traps are comparable to those at the Sandy Beach site near Petersburg, and appear to be a standard form used approximately 2,000 years ago. The Tonka Saltery is now better documented with both contemporary and newly-discovered archival photographs and through oral accounts. The culturally modified trees are likely not eligible to the National Register of Historic Places, but are indicators of past Native forest use on the Lindenberg Peninsula.

Wood stake alignments on the former Island Point fish trap

Economics

Timber harvests have been a part of the social and economic fabric of Southeast Alaska since the early 1900s. Round logs and lumber were produced for local industrial and domestic use as fishing and mining drew increasing numbers of people to the region. In the 1950s, two pulp mills built at Ketchikan and Sitka were attracted by the U.S. Forest Service through long-term timber contracts. These pulp mills utilized the lower quality trees in each timber sale, which was usually over 50 percent of the volume. Thus, a stable and integrated sawmill and pulp mill industry has developed with its associated employment and economic activity. This regional timber industry, primarily dependent upon National Forest timber, has developed a place in world markets for high quality pulp and solid wood products. However, the pulp mill in Sitka closed in 1993, followed by the Forest Service cancellation of the Alaska Pulp Company long-term contract. Very little timberland was privately owned until 1979 when almost a million acres of Tongass National Forest lands were transferred to new native corporations. Production from those lands has been exported as logs and

supplied to the local pulp and sawmills. This occurred in increasing amounts until 1990 and has decreased significantly since then.

Annual timber harvest on the Tongass National Forest ranged between 232 million board feet and 471 million board feet (net sawtimber plus utility) during the decade from 1984 through 1994, reaching the high point in 1990. Production of timber from native corporation lands during this period peaked in 1989 with an estimated harvest of 532 million board feet (export sawlogs plus pulplogs). The 1994 native corporation harvest had dropped to 215 million board feet and will likely decline further in subsequent years. If native harvests continue to decline, National Forest timber could become a relatively larger portion of the total supply in the future.

Direct and indirect employment in the timber industry in Southeast Alaska averaged 4,775 employees between 1984 and 1994, reaching a high of 6,113 in 1990 and then declining 37 percent in 1994 (USDA Forest Service 1995). Direct employment includes those jobs related to logging and processing timber. Indirect employment is employment in transportation, service, and supply businesses that results from the activities in the timber and wood products industry. This significant decline in total industry and related employment since 1990 has resulted from several factors. Most important are the decline in the private harvest, the closing of the pulp mill in Sitka in 1993, the 1994 closing of the sawmill in Wrangell, and the decline in harvesting on the Tongass National Forest.

The total direct and indirect jobs generated for the average of all timber harvested was 6.28 per million board feet, while the direct to indirect job ratio for Tongass National Forest timber was 7.52 during the past six year period (Newport 1995). This was due to the export restrictions in effect on National Forest timber. These restrictions result in greater portions of the round log production being processed in sawmills and pulpmills, which also employ higher numbers of workers per million board feet of round logs processed. In terms of wage and salary income, the value of each job resulting from timber harvest on the Tongass National Forest has been estimated by the Forest Service to be $33,300 for Fiscal Year 1990 (USDA Forest Service, 1990).

Chapter 4

Environmental Impacts

Chapter 4

Environmental Impacts

This chapter discusses the environmental consequences expected to result from the South Lindenberg Timber Sale. In doing so it provides the scientific basis for the comparison of alternatives in Chapter 2, and presents the foreseeable physical, biological, social, and economic impacts of each of the project alternatives. Chapter 4 is organized by resource, following the outline of Chapter 3 where appropriate. All significant or potentially significant impacts are disclosed, including the direct, indirect, and cumulative effects. Assessment of cumulative effects are based on both the Forest Plan (USDA Forest Service, 1985-86) and the Draft Forest Plan Revision (USDA Forest Service, 1991b). Effects are quantified where possible, although qualitative discussions are often necessary. Mitigation and monitoring considerations are discussed for each resource. Chapter 4 concludes with a discussion of the unavoidable adverse impacts, the relationship between short-term uses and long-term productivity, irreversible and irretrievable commitment of resources, and conflicts with the plans and policies of other jurisdictions.

Soils

Timber harvest activities such as removal of trees, road and landing construction, and rock pit site development may reduce soil productivity and increase the likelihood of accelerated erosion and sedimentation. At the same time, soil productivity, nutrient cycling, and biomass production may actually increase in other harvest areas because of increases in solar radiation and soil warming.

Impacts to the soils conditions in the South Lindenberg area can be assessed by considering what effect timber harvesting activities will have in relation to soil type, slope gradient, and potential for sediment delivery to the stream channel system. Harvest activities may or may not have an impact on soils conditions of selected units and watersheds. However, it is important to identify areas that may have a potential to be impacted and select alternatives that will minimize impacts and still attain harvest needs.

The primary soil resource concern is the potential for mass movement and soil displacement. Consequences from timber harvest are related to the number of acres harvested and the probability of soil erosion within the harvest units. Soil hazard classes rank the probability of soil erosion, in the form of mass movement, resulting from logging or road building activities. The probability is related to a number of factors such as soil strength, soil wetness, and slope.

4 Environmental Impacts

Soil Productivity Impacts

Soil nutrients and plant growth are generally restricted to the upper, organically rich layers. Removal or destruction of these layers would have a severely adverse effect on soil productivity and tree growth. Ground disturbance from harvesting practices may also include the compaction and deformation of the soil which may impede soil drainage and thus reduce productivity. Soil would be removed from production by the construction of roads, skid trails, landings, and rockpits. Soil displacement or compaction resulting from harvest practices can result in both a long-term and short-term decrease in productivity. The impacts from road and landing construction would be long-term. However, the soil productivity, soil drainage, and vegetation would not be measurably altered by road construction except for the width of the roadfill itself. Alternative 2 proposes the greatest amount of harvested area (1,815 acres) followed by alternatives 4, 5, and 3 with the respective harvested areas of 1,734, 1,727, and 1,725 acres. For roads, Alternative 3 proposes the greatest number of road miles (29) followed by alternatives 4, 2, and 5, with 26, 23, and 22 miles, respectively.

Soil Erosion Impacts

The dominant erosional process for the South Lindenberg area is mass movement in the form of landslides and debris avalanches. Vegetation, particularly tree roots, have a stabilizing effect on soils. Clearcutting can decrease this soil holding capability and increase the likelihood of soil movement on steep slopes.

V-notch channels are associated with erosion and sedimentation from the steeper terrain within the South Lindenberg area. V-notch channels are highly erosive and once established, provide efficient sediment delivery to streams. A major soil resource concern is to reduce sediment input to V-notches. V-notches have a long-term impact since they continue to erode and deliver sediment.

Windthrow is a significant erosion inducing mechanism that disturbs the soil, destabilizes slopes, and often initiates landslides, especially on steep, high hazard slopes. Forested areas adjacent to clearcuts are more susceptible to windthrow. Windthrow is a severe problem when it occurs near V-notches, since these drainages efficiently transport the eroded material to important streams. Windthrow creates long-term impacts if landslides are initiated. If landslides are not initiated the impacts of erosion from exposed mineral soils would be short-term, since vegetation will rapidly re-establish on these sites.

Soil Hazard Classes

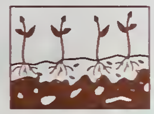
Soils in the low hazard classes are found on the relatively gentle slopes. They are stable in the natural setting and have little probability of movement if disturbed. Moderate hazard soils are generally found on 35 to 75 percent slopes. They are usually stable in the natural setting, but the probability of movement increases if they are disturbed. The soils in the high hazard classes are also typically found on slopes of 35 to 75 percent. They often show signs of instability in the natural setting and are prone to soil movement if disturbed. Extreme hazard class soils are generally found on slope gradients exceeding 75 percent. In the natural setting they often exhibit serious mass movement features such as landslides, slumps, and V-notches. These soils should not be disturbed. Roads can sometimes be built on these areas, however, by locating them on included areas of less steep benches, or by the application of unusual, and often expensive, mitigative measures. These areas are considered unsuitable for timber production and harvesting is usually not conducted.

Timber Harvest and Soil Hazard Class

The probability of impacts to the soil resources is related to the acres of lands harvested within each soil hazard class. Impacts become increasingly probable as more acreage is harvested on soils in the high hazard class. Harvest unit acres with Class III soils range from 82 to 139 acres. Among the four action alternatives, Alternative 2 has the least harvest unit acres of Class III soils (Table 4-1). Alternative 1 would result in no acres harvested; therefore no impacts that would increase erosion or reduce soil productivity would be anticipated.

Road Building and Soil Hazard Class

Road construction on steep slopes may increase the susceptibility for landslides. High and extreme hazard soils that are disturbed by blasting of rockpits, road pioneering, side casting of excavated materials, or other road construction activities have a high likelihood of mass movement when subjected to heavy rainfall. Roads can change natural drainage patterns and cause detrimental changes in soil drainage. Concentrated flows from improperly designed roads can increase the likelihood of off-site impacts such as landslides, increased streambank erosion, and increased sediment delivery. Stream crossings, both temporary and permanent, would have short-term impacts during construction. Improperly designed and maintained roads, including the stream crossings, can have long-term impacts.



Road building impacts are related to the length of road constructed and the soil hazard class in which each segment of road is built. Among the action alternatives, the number of miles of proposed roads within each soil hazard classification ranges between 9 and 13 miles for Class I soils, 7.7 and 12.6 miles for Class II soils, 0.3 and 0.5 miles for Class III soils, and 0 miles for Class IV soils (Table 4-2). Alternatives 2 and 5 propose roads within the least amount of Class III soil hazards and has a correspondingly smaller potential for impacts. Alternative 1 proposes no road construction and would result in no impacts.

Table 4-1
Acres of Proposed Harvest by Soil Hazard Class[1]

Proposed Alternative	1-Low	2-Moderate	3-High	4-Extreme	Total
Alt 1	0	0	0	0	0
Alt 2	548	1,101	82	0	1,734
Alt 3	501	1,080	141	0	1,725
Alt 4	446	1,225	141	0	1,815
Alt 5	503	1,081	140	0	1,727

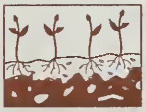
[1]Based on inventory soil hazard classes with field verification

Table 4-2
Miles of Proposed Road by Inventory Soil Hazard Class

Proposed Alternative	1-Low	2-Moderate	3-High	4-Extreme	Total
Alt 1	0.0	0.0	0.0	0.0	0.0
Alt 2	11.3	9.3	0.3	0.0	20.9
Alt 3	13.0	12.6	0.5	0.0	26.1
Alt 4	12.1	11.5	0.5	0.0	24.1
Alt 5	9.1	7.7	0.3	0.0	17.1

Cumulative Effects

Cumulative impacts to soil resources are important primarily on the watershed scale. Since the South Lindenberg timber sale is not the first harvest in most of the watersheds in the area, cumulative impacts would not be limited to effects of this harvest. Past harvesting activities may have resulted in increased potential for instability in some areas. Although future harvests in the South Lindenberg area may add to these effects, reconnaissance of previously harvested sites in the Stikine area has indicated that stabilization and revegetation occurs quite rapidly. While some unstable sites, such as V-notches and debris avalanches, can become chronic sources of sediment, most slides or slumps are expected to recover quickly.



In contrast, effects of permanent roads are a long-term impact and future harvests would be cumulative to those of the South Lindenberg sale. Although road design would maintain existing drainage patterns to the extent possible, permanent road construction typically results in some concentration of runoff, which may affect downstream channels. The roads would always be a source of slightly accelerated erosion, and road drainage may continue to de-stabilize critical slopes with extreme and high hazard soils.

Mitigative Measures

Soil Productivity

Best management practices (BMPs) designed to protect the long-term productivity of the soil have been applied to all alternatives (USDA Forest Service, 1991c). These recommended BMPs are site specific and have been included on the Unit and Road Design Cards.

The interdisciplinary approach was used (BMP 13.2) to determine the appropriate timber harvest unit design that would secure favorable conditions of soil productivity and minimize soil erosion sedimentation. The use of partial suspension cable yarding systems was recommended to reduce the disturbance and displacement of the nutrient rich surface layers. Shovel yarding was designated for appropriate areas with thin and easily disturbed alluvial surface soils (BMP 13.9).

Roads were designed to minimize the impacts to natural drainage patterns, and the length and width of roads have been kept to a minimum (BMP 14.3) when the alternatives were designed. Culvert pipe on temporary roads would be removed and water bars installed at the completion of the intended use of the roads to reduce the generation of sediment (BMP 14.24). Rock borrow pits would be located (BMP 14.18) to minimize sediment production.

Soil Erosion

Timber sale planning, timber harvest unit designs, and the designation of water quality protection needs utilized the interdisciplinary approach throughout the EIS process to ensure that soil erosion concerns and recommendations are addressed. Practices recommended by the interdisciplinary team that would reduce erosion from harvest sites included determining the suitability of shovel logging, protecting alluvial soils, utilizing partial and full suspension yarding systems to minimize soil disturbance, split yarding away from V-notches and Class III streams, designing and locating log landings for erosion control, appropriate timber sale operations to prevent erosion, and establishing vegetative cover on disturbed areas. Other recommendations to reduce surface erosion include grass seeding, and limiting the operating period of the timber sale.

Proposed harvest and road areas that are within designated extreme hazard zones were excluded from consideration. The recommended practice for roads crossing V-notch channels was to avoid the V-notch entirely, or extensively control road drainage. Road crossings, including those associated with V-notches, include mitigative measures outlined in BMPs 12.6, 12.6a, 14.10, 14.11, 14.12, 14.14, and 14.17. As discussed above, temporary roads will be closed following use.

Site specific recommendations were made by the soils team leader to reduce the impacts from windthrow, especially as an input of sediment to V-notches. As the Unit Design Cards were being developed, the interdisciplinary team identified and designated water quality protection needs (BMP 13.3) which addressed V-notches, boundaries of harvest units, FDRs (Forest Development Roads), and areas of known mass instability.

Minerals

Mining activities within the South Lindenberg study area would predominately occur in the southwestern portion of the Lindenberg Peninsula where there are 42 active mining claims established. There are no identified occurrences of economically valuable minerals within the South Lindenberg area. However, a portion of the Duncan Canal/Zarembo Island mineral tract lies within the western border of the Lindenberg Peninsula. Based upon United States Bureau of Mines (USBOM) information this mineral tract has a moderate to high mineral development potential for barite, zinc, lead, and silver. In addition to these minerals and common variety industrial minerals such as sand and gravel, the South Lindenberg area is also considered to be potentially valuable for geothermal resources. Thus, construction of roads and the subsequent harvest of timber in the South Lindenberg area may improve accessibility for the assessment, development, and operation of mining interests.

The development of rock and borrow pits for road construction could expose fresh outcrops of bedrock, previously covered colluvium, or previously unknown placer and/or hardrock mineral occurrences. Any of these events could prompt an increased level of mineral exploration activity. The construction of roads into previously roadless areas would increase public access to the area, also increasing the level of mineral exploration. Some proposed harvest units and roads for alternatives 2, 3, 4, and 5 are located in areas that have no known mineral occurrences but are considered to possess moderate to high potential for undiscovered mineral deposits. The probability that timber harvest activities would directly result in the discovery of a previously unknown mineral resource is speculative and therefore not reasonably forseeable. Therefore, some impact to the resources of the South Lindenberg area could be expected with the increase in road use and mineral exploration activities. Alternative 1 proposes no harvest or road construction and would not increase the level of mineral exploration in the area.

Exploration Activity

Most of the exploration activity would occur during the summer months. The timing and level of activity could impact the visual and recreational resources of the area by an increase in the frequency of vehicles traversing the roadways and the associated road noise. Increased exploration activity could also disrupt wildlife resources in the area. These impacts are expected to be short-lived on the temporary logging roads, but they would persist for the permanent road as long as exploration continued.

Assuming that the increase in mineral exploration activity is proportional to the amount of roads and rockpits, alternatives with the highest number of road miles and rockpits would result in the greatest area affected by mineral exploration. Alternative 4, containing the greatest number of proposed and existing road miles (82.6), would probably have the greatest impacts. The impacts under alternatives 2 and 3 would be less than those of Alternative 4 but greater than Alternative 5, which has the least number of proposed and existing road miles (75.5). All action alternatives have an equal number of rockpits (16). Alternative 1, with no roads or rockpits, would pose no impacts.

Cumulative Effects

It is possible that timber sales on Kupreanof Island may allow the permanent road system within the South Lindenberg area to be connected with other road systems. This could result in a further increase in exploration activity and road use, especially if the road system eventually connects to Petersburg, effectively opening up a direct link between the Alaska State Marine Highway and the interior of Kupreanof Island. Even if this scenario should occur, the cumulative effect of mineral exploration activity within the South Lindenberg area is expected to be small in terms of absolute numbers of vehicles and people.

Mitigative Measures and Monitoring

Although road construction may increase access to areas previously accessible only by helicopter, float plane, or foot, the remoteness of the South Lindenberg interior makes it unlikely that increases in mineral exploration would cause significant impacts. No measures are recommended to mitigate the potential impacts of mineral exploration that may occur in the South Lindenberg area.

Watersheds

Hydrologic modifications associated with timber harvest can include alterations in storm peak flows, base flows, annual water yields, and the magnitude and frequency of rain-on-snow related flood events. Certain water quality parameters such as suspended sediment concentrations and turbidity can also be affected. Production of sediment and degradation of water quality are major concerns because of their effects on fisheries resources.

Timber management activities produce three types of watershed effects: direct, indirect, and cumulative. An example of direct effects would be a road-related landslide entering a stream. An indirect effect would be the same landslide terminating on the floodplain, where winter rains could erode fine sediments into the stream. An example of cumulative effects would be sediment entering many streams within a single watershed from the construction of additional roads during successive timber sales.

Direct and Indirect Effects

Hydrology

Hydrologic effects associated with timber harvest activities can include alterations to the storm peak flows, low flows, and annual water yields. Removing the vegetative cover reduces the amount of rainfall trapped on the plant surfaces and later evaporated back into the atmosphere. Removal also decreases the amount of water drawn up by plants from the soil. The reduction in these two factors (interception/evaporation and evapotranspiration) results in a greater amount of water in the soil during the summer growing season. This would result in greater flows during the summer base flow period and increase in the annual water yield (total water discharged each year). Removal of vegetation can also result in a greater magnitude of fall and early winter storm peak flows, because less precipitation is required to rewet the soil after the summer growing season. Water that would normally be bound to the soil can thus contribute to streamflows earlier in the rainy season.

The anticipated hydrologic impacts associated with timber harvesting within the South Lindenberg area under all action alternatives would be small except in watershed Unnamed 5 where three of the four action alternatives propose levels of timber harvest that meet and exceed the threshold of concern (Table 4-3), which available research indicates is between 20 percent (Harr, 1980) and 35 percent (Bartos, 1989). The area of proposed harvest within the review watersheds ranges from zero acres for Colorado Creek (Alternative 4), Skogs Creek (alternatives 2 and 5), and Unnamed Creek 7 (all alternatives) to 894 acres for Duncan

20 percent (Harr, 1980) and 35 percent (Bartos, 1989). The area of proposed harvest within the review watersheds ranges from zero acres for Colorado Creek (Alternative 4), Skogs Creek (alternatives 2 and 5), and Unnamed Creek 7 (all alternatives) to 894 acres for Duncan Creek in Alternative 4. (Refer to Chapter 3 for a map of the Lindenberg Peninsula drainage basins.) Runoff from clearcut areas due to rain-on-snow events is one of the most important sources of hydrologic impacts resulting from timber harvest. Because of the low percentage of timber acres harvested within most of the watersheds, the potential increase in runoff due to rain-on-snow events is low for all alternatives.

Increases in storm peak flows typically do not occur until about 20 to 25 percent of a watershed is logged (Harr, 1980). Research suggests that about 35 percent of a watershed can be logged before increases in base flows are observed (Bartos, 1989). Since the percentage of watersheds logged in the South Lindenberg harvest would generally be lower than these levels, increases in storm peak flows and base flows would not be expected. However, annual water yields may be expected to increase somewhat as the total area harvested in the watershed increases. Compacting soils by constructing roads within a watershed can also result in higher peak flows by reducing the infiltration capacity of the soil and thereby increasing the potential for overland flow. However, research indicates that increases in storm peak flows are not expected until about 12 percent of the watershed area consists of roads (Harr et al., 1975). The total percentage of roads within the major watersheds in the South Lindenberg harvest is much below this level (maximum of 2.98 percent for Unnamed 5 in Alternative 4); consequently, the amount of roaded area for any of the proposed alternatives is not expected to be high enough to increase peak flows (Table 4-4).

Table 4-3
Acres and Percentage of Watershed Area Harvested Under Each Alternative

	Total	Existing Conditions		2		3		4		5	
Watershed	Acres	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Colorado	3,543	0.0	0.0	167.3	4.7	33.5	0.9	0.0	0.0	0.0	0.0
Duncan	13,094	435.1	3.3	596.2	4.6	770.3	5.9	894.1	6.8	822.6	6.3
Mitchell	13,656	1,470.2	10.8	670.9	4.9	574.8	4.2	713.3	5.2	545.3	4.0
Skogs	5,192	0.0	0.0	0.0	0.0	140.6	2.7	127.5	2.5	0.0	0.0
Unnamed 1	4,977	580.5	11.7	30.9	0.6	30.9	0.6	30.9	0.6	30.9	0.6
Unnamed 2	848	13.9	1.6	32.2	3.8	20.5	2.4	0.0	0.0	29.8	3.5
Unnamed 3	363	23.0	6.3	18.5	5.1	5.2	1.4	0.0	0.0	5.2	1.4
Unnamed 4	444	3.3	1.9	3.9	0.9	0.5	0.1	0.0	0.0	3.6	0.8
Unnamed 5	884	178.0	20.1	47.6	5.4	18.4	2.1	46.4	5.2	45.5	5.1
Unnamed 6	961	0.0	0.0	164.0	17.1	127.9	13.3	0.0	0.0	176.1	18.3
Unnamed 7	1,142	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sedimentation

Sedimentation from surface erosion generally occurs when the ground has been disturbed by removing the vegetative cover. The most common surface disturbance in timber management is roading and yarding activities. Surface erosion from roads can occur on the driving surface, in roadside ditches, and on side-cast material. The amount of erosion from these surfaces depends on many factors, including the amount of usage, slope, type of covering (vegetation, rock, etc.), and amount of precipitation. The precise impacts from road surface erosion depends on the proximity to streams and whether or not overland flows directly join the sediment source and the stream. The absence of direct connection of

The magnitude of sedimentation effects is directly related to the length of streams within or adjacent to harvest units (defined as within 100 feet of harvest unit boundaries), because of the short transport distance for any eroded sediment and the possibility of direct stream disturbance. Turbidity and other sedimentation effects should decrease with increasing distance between harvest activities and the stream channel. Alternative 1 would have no anticipated sedimentation effects beyond existing conditions, because no new management activities are proposed. Alternative 3 has the greatest potential for affecting streams, with

Table 4-4

Existing and Proposed Road Acres and Percentage by Watershed and Alternative

Watershed	Total Acres	Alt 2 Acres	Alt 2 %	Alt 3 Acres	Alt 3 %	Alt 4 Acres	Alt 4 %	Alt 5 Acres	Alt 5 %	Current Conditions Acres	Current Conditions %
Colorado	3,543	32.2	0.9	5.8	0.2	0.0	0.0	5.8	0.2	0.0	0.0
Duncan	13,094	55.9	0.4	65.4	0.5	66.4	0.5	66.4	0.5	51.1	0.4
Mitchell	13,646	52.7	0.4	49.7	0.4	50.0	0.4	37.0	0.3	213.8	1.6
Skogs	5,192	0.0	0.0	37.0	0.7	37.0	0.7	0.0	0.0	0.0	0.0
Unnamed 1	4,977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.6	1.5
Unnamed 2	848	7.2	0.5	7.2	0.8	0.0	0.0	7.2	0.8	1.9	0.2
Unnamed 3	363	0.0	0.0	0.5	0.1	0.0	0.0	0.5	0.1	4.6	1.2
Unnamed 4	444	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	3.8	0.8
Unnamed 5	884	2.3	0.3	2.3	0.3	2.6	0.3	2.3	0.3	24.2	2.7
Unnamed 6	961	16.1	1.7	18.1	1.9	13.0	1.4	16.1	1.7	0.0	0.0
Unnamed 7	1,142	0.0	0.0	8.0	0.7	8.0	0.7	0.0	0.0	0.0	0.0

Fallen trees help stabilize stream channels during floods

over 28 miles of Class III streams within or adjacent to harvest units, followed by Alternative 5 with 26.8 miles, Alternative 4 with 26.1 miles, and Alternative 2 with 22.8 miles (Table 4-5).

Stream crossings can cause channel erosion when flows are constricted through culverts or bridge pilings. Constricting flows generally increases the water velocity, which in turn increases the stream power and the erosion potential of the water. During storm flows, eddies created downstream of culverts can erode both stream banks and unprotected road fill. The greater the number of stream crossings, the greater the potential for sediment inputs into streams. Field observations in previously harvested areas of the South Lindenberg area confirmed that some stream crossings had failed and that some erosion of stream banks and unprotected road fill has occurred. Although no systematic inventory of stream crossings was conducted, three stream crossings were observed to have failed, two on tributaries to Mitchell Creek and one on a tributary to Duncan Creek. See the Chapter 4 section on Fish in this EIS for further discussion of potential impacts of proposed stream crossings within the South Lindenberg area.

Table 4-5
Class III Stream Miles in or Adjacent to Harvest Units[1] by Watershed Alternative

Watershed	Alt 2	Alt 3	Alt 4	Alt 5
Colorado	2.7	0.6	0.0	1.0
Duncan	7.9	13.3	13.8	13.8
Mitchell	6.9	6.9	7.9	6.4
Skogs	0.0	3.1	3.1	0.0
Unnamed 1	0.7	0.7	0.7	0.7
Unnamed 2	1.6	2.3	0.0	2.7
Unnamed 3	0.4	0.2	0.0	0.2
Unnamed 4	0.1	0.1	0.0	0.1
Unnamed 5	1.1	0.1	0.6	0.4
Unnamed 6	1.4	1.3	0.0	1.5
Unnamed 7	0.0	0.0	0.0	0.0
Total	22.8	28.6	26.1	26.8

[1]Within 100 ft of harvest unit

Other Water Quality Impacts

Besides sedimentation effects on turbidity and suspended solids discussed above, other potential inputs that could affect water quality include fuel, oil and grease spills, and effluent from sanitary facilities. Petroleum products may enter aquatic environments during equipment refueling or storage spills. The effect of these spills would depend on the type of product, amount spilled, time of year, and proximity to water. Sanitation facilities for labor or logging camps can result in increased nutrient loading to streams, and, if not properly maintained, in risks to human health. However, no logging camps are proposed for the South Lindenberg Timber Sale. The risk of water quality impacts from spills is about the same for all alternatives except Alternative 1, where no activities are occurring.

Cumulative Effects

Disturbances within a watershed due to management activities can be individually quite small, but may collectively result in larger basin-wide disturbances, or cumulative effects. As these disturbances accumulate, they can affect each other in various combinations over a long period. Cumulative ef fects may lead to increased erosion, streamflow, and channel

migration. Although there has previously been timber harvest and road construction within the South Lindenberg area, the levels of proposed harvest and road construction are generally lower than would be expected to produce significant cumulative effects for all of the action alternatives, except in watershed Unnamed 5.

No other timber sales are currently planned within the next decade for watersheds in the South Lindenberg sale area. If future, as yet unplanned, harvests are expected to take place in the South Lindenberg area over a 10 to 50 year time frame, cumulative increases in sediment input, storm peakflows, and lowflows would certainly contribute to greater cumulative effects, although the extent of these effects is presently unknown.

Mitigative Measures

Hydrology

Adverse changes in runoff timing and yield are not likely. Research indicates that significant changes do not occur until more than 25 percent of a watershed is harvested or 12 percent of a watershed is covered by roads. No watershed will be harvested at greater than 25 percent and total roading will be much less than 12 percent. Any changes that might occur would likely recover in about 25 years (McCorison et al., 1988; Harr, 1980; Harr, et al., 1975).

Sedimentation

The potential impacts from roads and stream crossing should be reduced to minimal levels by instituting appropriate BMPs for road construction, such as revegetation, rock armoring, and temporary culvert removal, as described in the Soil and Water Conservation Handbook (USDA Forest Service, 1993a). The potential for harvest impacts should be minimized by instituting BMPs such as falling trees away from streams, using appropriate logging systems, and avoiding unstable areas. To minimize the cumulative road impacts on watersheds the total area of roads within each watershed should not exceed 12 percent (Table 4-4) (Harr, et al., 1975).

Other Water Quality Impacts

The potential impacts from timber harvest and associated activities (log storage yards, petroleum, oils) should be reduced to minimal levels by instituting appropriate BMPs for water quality described in the Soil and Water Conservation Handbook and required contingency plans. These may include refueling away from streams and wet areas, and locating waste treatment facilities away from water.

Short-Term vs. Long-Term

Short-term effects from timber harvest activities could result in sediment and temperature related impacts to streams. Revegetation of harvest areas over time should significantly reduce these impacts so that long-term productivity is unaffected. Permanent roads would continue to contribute some sediment over time and could have a small impact on long-term productivity of fish resources.

Soil and water are key factors in ecosystem productivity, and impacts to these resources would be minimized in all alternatives to avoid damage that could take many decades to rectify. Quality and quantity of water from the South Lindenberg area may fluctuate in the short-term, but no long-term effects to the water resources are expected to occur as a result of timber management activities.

Timber

The short-term and most obvious effect of timber sale activities on the Lindenberg Peninsula would be the conversion of old-growth forests stands within the areas harvested into young,

early successional timber stands. All action alternatives prescribe harvest over a similar number of acres. Alternative 4 has the highest number of harvested acres (1,815 acres), followed by Alternative 2 (1,734 acres), Alternative 5 (1,727 acres) and Alternative 3 (1,725 acres). No harvest would occur for Alternative 1, the no action alternative.

Each action alternative would have similar effects on the amount of commercial and suitable forest land within the South Lindenberg area, although there would be differential effects by VCU (see Figures 4-1 through 4-5 and Table 4-6). Commercial forest land includes those areas that can produce commercial quantities of industrial wood. Suitable forest land includes only those lands that can be regenerated successfully, logged without causing irreversible soil damage, and are not withdrawn from timber production by statute or administrative action. The timber harvesting proposed under the action alternatives would result in changes in the amount of acres by volume class, size class, and species type. For purposes of this assessment, the acres affected by harvest include the acres harvested by clearcutting and the number of acres to be harvested under group selection. In the following sections these effects are summarized, and related issues such as productivity, windthrow, and forest health are also discussed. The following discussion of environmental effects on the vegetative land base is from concerns and issues expressed by the public and the ID Team. The following effects are addressed:

- harvest treatments,
- volume class distribution,
- plant succession,
- timber size class distribution,
- species composition,
- growth,
- forest health, and
- windthrow.

Harvest Treatments

The selection of appropriate silvicultural treatments is a concern expressed by the public and professional foresters. Foresters are concerned that timber can be removed efficiently while regenerating a new stand and maintaining long-term productivity, which is discussed in this section. Much of the public concern over timber harvesting is related to the landscape effects of clearcutting, which are discussed in the visuals, watershed, soils, wildlife, fisheries, and biodiversity sections of this chapter. In addition, members of the forest products industry are concerned that the silvicultural treatments used will be cost effective; the results of the economic analysis are discussed in the economics section.

Appropriate silvicultural treatments for Southeast Alaska were considered by the ID Team during the analysis of this project. Both even and uneven-aged silvicultural systems are approved for use in the South Lindenberg area depending upon specific resource needs (USDA Forest Service, 1983). Even-aged management is recommended when the management objective is to maintain fast-growing, mistletoe-free stands of mixed species.

Uneven-aged management is recommended on sites where significant windthrow is not anticipated and where the management goal does not include high timber yields of mixed species, or where other resource concerns require this kind of stand structure.

Clearcutting is an even-aged silvicultural system where all merchantable trees are removed from a given area or harvest unit. This method is recommended and is considered appropriate for use in the western hemlock-Sitka spruce forest type (USDA Forest Service, 1983; Harris and Johnson, 1973). Characteristics of this cutting method include:

Figure 4-1
South Lindenberg Area Land Base - Alternative 1 "No Action"

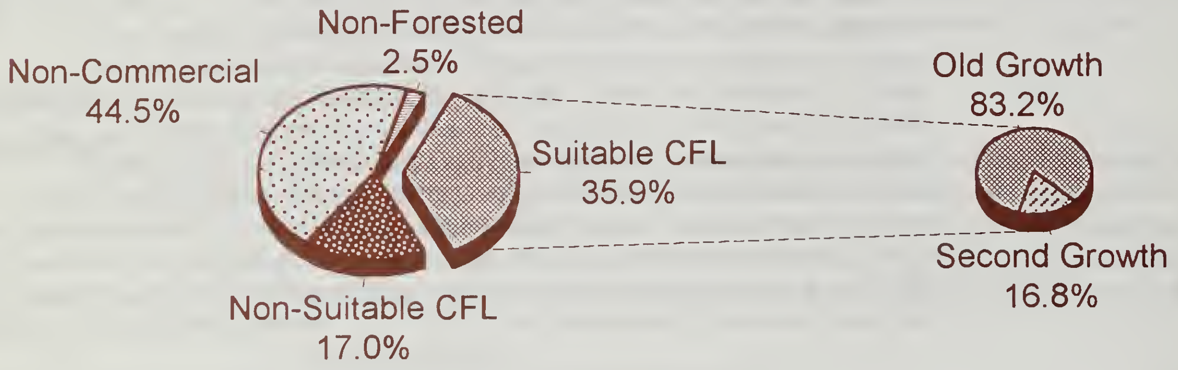


Figure 4-2
South Lindenberg Area Land Base - Alternative 2

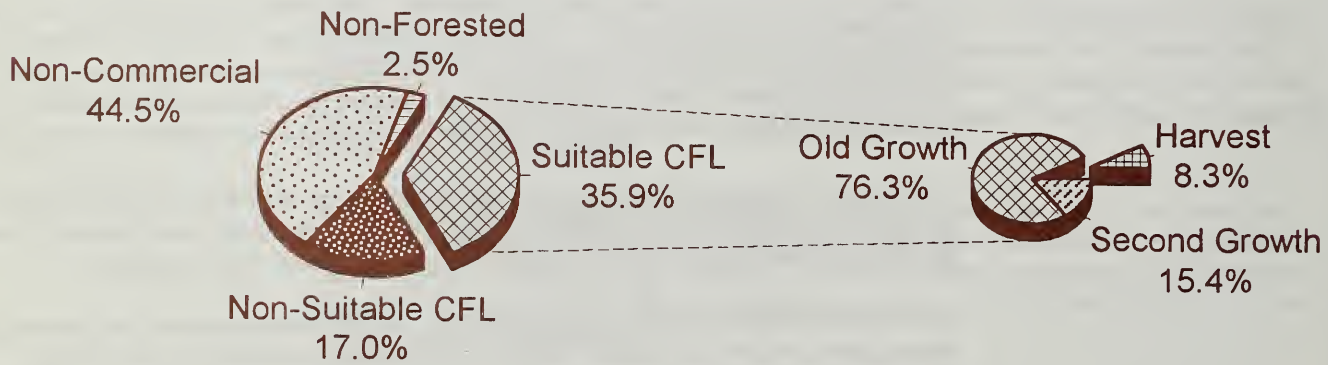


Figure 4-3
South Lindenberg Area Land Base - Alternative 3

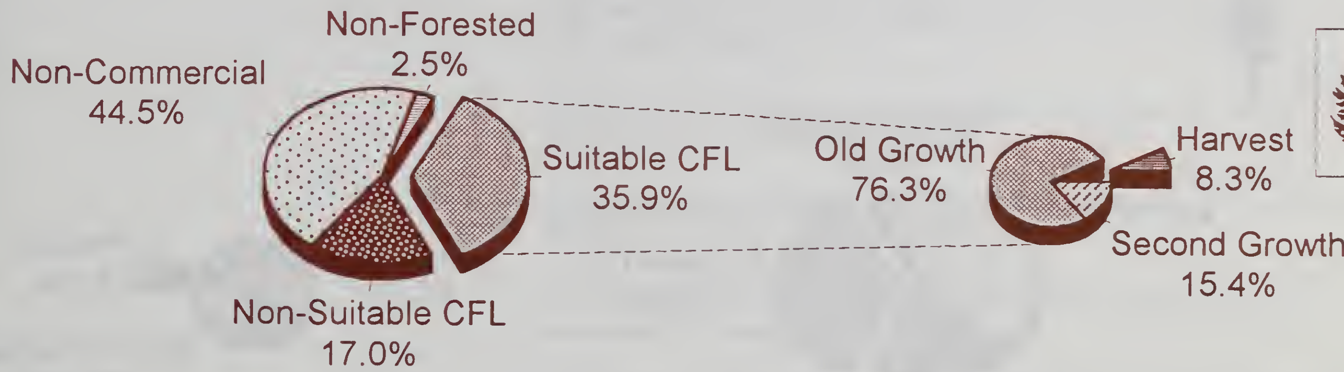


Figure 4-4
South Lindenberg Area Land Base - Alternative 4

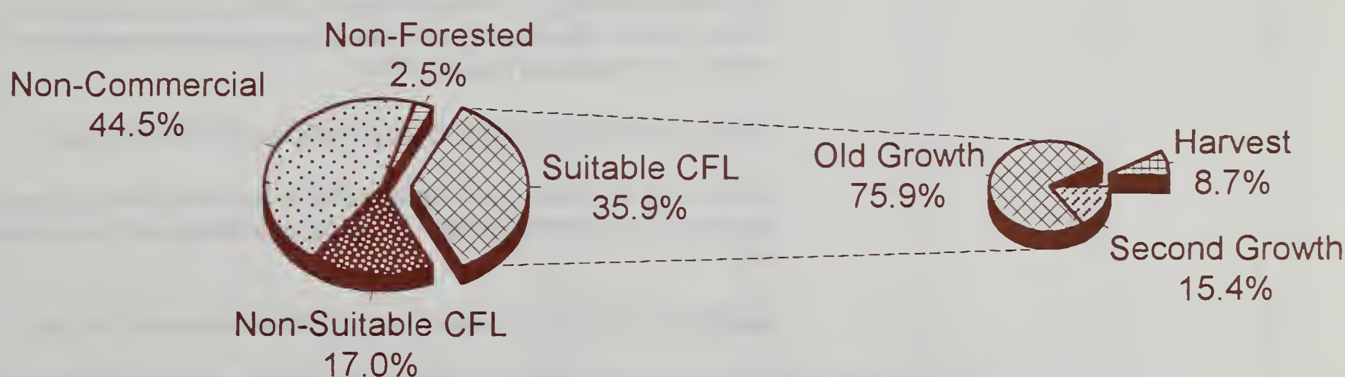
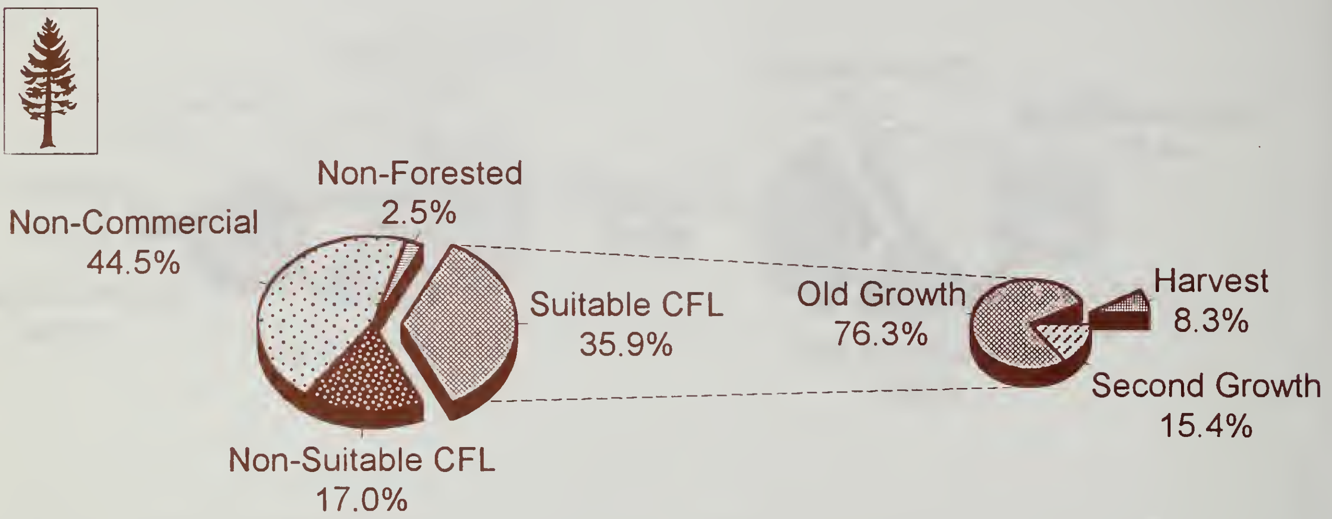


Figure 4-5
South Lindenberg Area Land Base - Alternative 5



- logging costs are lower than for partial cutting;
- solar radiation raises soil temperature accelerating decomposition of organic matter and releasing nutrients that temporarily increase site productivity (Ruth and Harris, 1979);
- natural regeneration is adequate to provide a fully stocked stand;
- Sitka spruce is favored due to destruction of advance hemlock regeneration and creation of mineral seedbed favorable to Sitka spruce regeneration; and
- residual overstory trees infected with dwarf mistletoe are removed.

National Forest Management Act regulations provide that 100 acres is the maximum size of created openings allowed for the western hemlock-Sitka spruce forest type of coastal Alaska unless excepted under certain conditions (USDA Forest Service, 1983). For the South Lindenberg harvest, no proposed units or unit combinations exceed the 100 acre size limitation.

The clearcutting prescribed under the action alternatives would include leaving old-growth residual trees in reserve tree clumps. Clearcutting with reserve trees is proposed to mitigate visual and wildlife/biodiversity effects of converting old-growth stands to young second-growth stands. These proposed prescriptions include leaving clumps between 0.5 and 1.0 acres between logging settings to provide a legacy of the old-growth stand that has been

harvested. Guidelines for retaining reserve trees are found in *Reserve Tree Selection Guidelines* (USDA Forest Service, 1993b). Reserve tree prescriptions have the following characteristics:

- the visual size of clearcut openings is reduced by leaving standing trees;
- residual green trees provide a structural legacy of the old-growth forest;
- residual green trees provide a source of potential snags for cavity-nesting birds and a potential supply of large downed woody material for other wildlife species;
- logging costs are higher than conventional clearcutting but can be minimized by properly locating reserve tree clumps;
- there is an increased risk of windthrow, although this can be mitigated by selecting relatively windfirm leave trees;
- mistletoe-infected trees could infect the managed stand. but can be mitigated by leaving infection-free trees;
- a seed source of selected species can be maintained for the regenerated stand; and

Table 4-6

Comparison of Harvest by Action Alternative in the South Lindenberg Area

Alternative	VCU	Proposed Harvest (Acres)	Suitable Forest Land (%)	Commercial Forest Land (%)	Land Area Harvested (%)
2	437	702	7.7	5.1	3.0
	439	599	10.6	7.8	4.2
	447	433	8.2	5.6	2.5
	448	0	0.0	0.0	0.0
	Totals	1,734	8.3	5.6	3.0
3	437	608	6.6	4.4	2.6
	439	773	13.7	10.0	5.4
	447	344	6.5	4.4	2.0
	448	0	0.0	0.0	0.0
	Totals	1,725	8.3	5.6	3.0
4	437	733	8.0	5.3	3.1
	439	896	15.9	11.6	6.3
	447	186	3.5	2.4	1.1
	448	0	0.0	0.0	0.0
	Totals	1,815	8.7	5.9	3.1
5	437	579	6.3	4.2	2.4
	439	825	14.6	10.7	5.8
	447	323	6.1	4.2	1.8
	448	0	0.0	0.0	0.0
	Totals	1,727	8.3	5.6	3.0

Suitable forest land totals 20,952 acres
Commercial forest land totals 30,932 acres
Total land area not covered by water equals 58,344 acres

- the timber volume contained in these trees would likely never be harvested or utilized in future entries.

Uneven-aged management in the form of small group selection is generally recommended when used to meet specific needs of non-timber resources such as visuals, wildlife, or recreation. Group selection cuts create small 1.5-to 2.5-acre openings, closely approximating the type of small-scale disturbance commonly found in southeast Alaskan ecosystems. Other characteristics of group selection cuts include:

- a continuous tree cover is maintained reducing visual change and potential soil erosion and maintaining deer habitat;
- natural regeneration is adequate with western hemlock favored due to more shade and less soil disturbance;
- there is a risk of dwarf mistletoe infection in understory if adjacent overstory is infected;
- logging costs are estimated to be 25 to 50 percent higher than for clearcutting;
- there is a potential increased risk of windthrow in residual timber stand;
- shade-intolerant plant species such as alder and salmonberry are not favored;
- additional roads need to be constructed and additional areas need to be harvested in order to produce an equivalent clearcut volume; and
- subsequent entries to remove remaining trees increase risk of soil compaction and logging damage to residual timber.

During the interdisciplinary analysis, silvicultural prescriptions initially proposed were modified to meet visual, soils, or watershed concerns. Group selection is a proposed prescription for several harvest units on the upper slopes facing both the Wrangell Narrows and Duncan Canal. This prescription is proposed primarily to meet visual quality concerns. Approximately 15 to 20 percent of a given unit would be harvested in these small openings.

A sanitation prescription is proposed for Unit 150 (4 acres), which would involve the harvest of trees heavily-infected by dwarf-mistletoe to improve the health of the stand.

The action alternatives prescribe varying levels of clearcutting and group selection. Table 4-7 shows the number of acres proposed to be harvested by cutting method, either clearcut, group selection, or sanitation. Alternative 1 (No Action) is not displayed since no acres would be treated. Group selection acres displayed in this table include both the entire harvest unit (left-hand column under Group Selection) and the actual acres that will be felled and yarded (right-hand column). Harvest in group selection units will be in areas of 1.5 to 2.5 acres covering between 15 and 20 percent of the harvest unit.

Table 4-7
Acres by Harvest Method - All Action Alternatives

Alternative	Clearcut	Group Selection In unit	Group Selection Harvested	Sanitation	Total Unit Acres	Total Acres Harvested
Alt 2	1,730	0	0	4	1,734	1,734
Alt 3	1,619	642	102	4	2,265	1,725
Alt 4	1,788	115	23	4	1,907	1,815
Alt 5	1,661	413	62	4	2,078	1,727

Each alternative roughly harvests an equivalent volume (40 to 41 MMBF); however, the amount of acres and volume harvested by VCU varies among alternatives. Table 4-8 shows the volume harvested by VCU for each of the action alternatives. Volumes are expressed in net sawlog and are based on Forest Service derived Volume Class Assumptions for Kupreanof Island (USDA Forest Service, (no date).

Volume Class Distribution

Each action alternative will have different effects on the amount of commercial forest land harvested. Table 4-9 shows the equivalent acres harvested by volume class for each of the action alternatives. For the entire South Lindenberg project area, alternatives vary in the amount of each volume class harvested. Area of Volume Class 6 varies most among alternatives, with Alternative 2 having approximately twice the area harvested as Alternative 4. The area of Volume Class 6 harvested, however, is considerably less than Volume Classes 4 and 5.

Table 4-8
Volume (MMBF) Harvested by Alternative and by VCU

VCU	Alternative 2	Alternative 3	Alternative 4	Alternative 5
437	15,040	13,780	16,440	13,030
439	13,480	17,480	19,770	18,410
447	11,970	8,930	4,010	8,890
448	0	0	0	0
Total	41,090	40,190	40,230	40,340

Although the total number of acres harvested by alternative are roughly the same, there are differences by VCU due to the different theme adopted under each alternative (see Chapter 2). Alternative 2 harvests the most (433) acres in VCU 447, which includes the east-facing slopes along the Wrangell Narrows, while Alternative 4 harvests the least (186) amount of acres in this VCU. Alternative 4 harvest the most (896) acres in VCU 439, which includes the Duncan Creek drainage, while Alternative 2 harvests the least (599) acres in this VCU. Alternative 4 also harvests the most (733) acres in VCU 437, which covers the Mitchell Creek drainage; Alternative 5 harvests the fewest (579) acres in this VCU. No harvest under any alternative would occur in VCU 448.

Table 4-9
Acres Harvested by Volume Class and Alternative

Alternative	Volume Class 4	Volume Class 5	Volume Class 6	Other[1]	Totals
Alt 2	551	864	301	19	1,734
Alt 3	471	1,015	214	25	1,725
Alt 4	549	1,116	155	31	1,815
Alt 5	502	962	240	23	1,727

[1]Includes Volume Class 3

Harvesting would convert acres in Volume Classes 4 through 6 to even-aged seedling (second-growth) stands. Volume Classes 4 - 6 currently comprise 84 percent of the total suitable CFL acreage (Alternative 1, Table 4-10). Under each action alternative the proportion of acres remaining in the volume classes would be reduced to 76 percent of the total suitable CFL average. Following harvest, Volume Classes 4 through 6 in VCU 437

would retain between 69 to 70 percent of the suitable landbase;. VCU 439 would retain between 71 and 75 percent; and VCU 447 would retain between 86 and 90 percent. Since no harvest occurs in VCU 448, the percentage would remain at 97 percent.

Table 4-10
Remaining Acres by Volume Class and Alternative

Alternative	Volume Class 3	Volume Class 4	Volume Class 5	Volume Class 6	Totals
Alt 1	3,246	8,604	7,873	1,229	20,952
Alt 2	4,959	8,056	7,009	928	20,952
Alt 3	4,994	8,135	6,858	1,015	20,952
Alt 4	5,027	8,058	6,790	1,076	20,952
Alt 5	4,948	8,105	6,911	989	20,952

Volume Class Distribution

Volume Class 6 acres as a proportion of all suitable acres in Volume Classes 4 through 6 would decline slightly under all action alternatives. The proportion of Volume Class 6 would drop from 7.0 percent to 6.8 percent for Alternative 4, 6.4 percent for Alternative 3, 6.2 percent for Alternative 5 and 5.8 percent for Alternative 2.

Plant Succession

The areas harvested under each action alternative would undergo a major change in species composition and stand structure. Harvest would initiate a process of secondary plant succession and stand development, which includes the following stages:

- seedling-sapling understory colonization stage;
- dense, closed forest and understory exclusion stage,
- mature, even-aged forest and understory reinitiation stage; and
- old-growth stage.

Seedling-Sapling Understory Colonization Stage

During the first five years following a clearcut harvest, there would be rapid establishment of tree species, shrubs, forbs, and grasses. Increased temperature and sunlight would stimulate the breakdown of organic material, increasing nutrient availability and vegetation growth. Species such as Alaska blueberry and red huckleberry would increase in productivity due to vigorous sprouting from underground stems (Alaback, 1982). Huckleberry and salmonberry would respond positively to the removal of the tree canopy. The mineral seed bed produced by ground disturbance in clearcuts favors Sitka spruce, as well as non-commercial species such as salmonberry and alder. Mosses, lichens, herbs, and shrubs that thrive best in the shade and protection of a mature overstory would be reduced in vigor and competitive ability. Removal of understory would make adjacent stands more susceptible to windthrow. Understory development along the edge of adjacent timber stands would increase due to additional sunlight.

Between years 5 and 20, Sitka spruce and western hemlock seedlings would grow into a young forest, containing approximately 5,000 stems per acre with diameters between 1 and 3 inches and approximate heights of 20 feet (USDA Forest Service, 1991b). Understory production of woody stemmed species is at its highest at this stage, especially in *Vaccinium*-dominated sites. Larger dead materials from the original stand begin to decompose, and the stand edge stabilizes, resulting in less windthrow. At this age these stands would be considered for precommercial thinning.

Dense, Closed Forest, and Understory Exclusion Stage

Between the ages of 20 and 80 years, trees would grow rapidly, averaging about one foot in height per year (USDA Forest Service, 1991b). Tree crowns would close, forming a dense canopy, causing rapid reduction in understory biomass and an increase in dense moss. Stands would develop a two-layered canopy with western hemlock in the lower tier. Canopy closure would occur more slowly in precommercially thinned sites. At age 80, growth would begin to slow as competition between trees increases.

Mature, Even-aged Forest and Understory Reinitiation Stage

In years 80 to 100, the stand would become mature. At age 100, tree heights would range from 90 to 120 feet and diameters would range from 10 to 15 inches, depending upon site productivity (USDA Forest Service, 1991b). Some trees would die while others would become dominant in size. Wood decay and defect would become a more significant component of the standing timber volume. Moss would continue to dominate the understory, except in places where the canopy has been opened to allow sufficient sunlight for herbaceous plants. This would be the normal rotation age, where a regenerated stand would be considered for harvest. For those stands managed for longer rotations, the above structural characteristics would continue into the later stages of the stand (120 to 140 years) with continued slow growth and occasional openings in the canopy.

Old-Growth Stage

In addition to the above successional stages for managed stands, the balance of the commercial forestland would remain in an old-growth stage. This stage contains the highest degree of variation and has the most structurally diverse understory of any successional stage (Alaback, 1982). The old-growth forest is characterized by patches of shrubs, tree saplings, and herbs alternating with patches of overmature timber, making a complex multilayered mosaic. During this stage, growth and vigor declines.

Recent clearcut along Road 6350 in the Mitchell Creek drainage

Timber Size Class Distribution

The acres remaining in each size class after harvest do not differ substantially among action alternatives. Action alternatives would reduce Size Class 4 acres from the current 17,706 acres (alternative 1) to approximately 16,000 acres, 76 percent of the Suitable CFL (see Figures 4-1, 4-2, 4-3, 4-4, 4-5). Young-growth stands would comprise approximately 4,900 acres or 24 percent of the Suitable CFL. Table 4-11 displays the number of acres in size class by VCU for each alternative. For purposes of this analysis, we assume that the equivalent acres harvested under group selection will be converted to Size Class 1 and are displayed as such in the following tables.

Species Composition

The open conditions created by clearcutting and group selection would allow both Sitka spruce and western hemlock to regenerate rapidly. The spruce component would increase in most cases. The average volume of spruce created in the regenerated, even-aged stand would be about 50 percent (Taylor 1934), as opposed to 17 percent in the existing overmature stands in the South Lindenberg area. In those areas harvested under group selection, spruce may not account for as high a proportion as in clearcut stands, but will still probably be higher than in the surrounding unharvested area.

Table 4-11
Remaining Acres by Size Class and Alternative

Alternative	Size Class 1	Size Class 2	Size Class 3	Size Class 4	Totals
Alt 1	3,185	60	0	17,706	20,952
Alt 2	4,898	60	0	15,993	20,952
Alt 3	4,883	60	0	16,008	20,952
Alt 4	4,967	60	0	15,925	20,952
Alt 5	4,887	60	0	16,005	20,952

Size Class 1 - Seedling/Sapling (0" to 4.9" DBH); Size Class 2 - Pole timber (5" to 8.9" DBH); Size Class 3 - Young Growth Sawtimber (9+" DBH & <150 years old), and Size Class 4 - Old Growth Sawtimber (9+" DBH & >150 years old).

Growth

The action alternatives would produce varying increases in volume growth as a result of harvesting (Table 4-12). Alternative 4 would result in the largest increase, mainly because it harvests the most acres. On a per acre basis Alternative 3 would give the highest increase, because it harvests the most potentially productive acres. The action alternatives would produce an annual board-feet growth between 761 MBF and 798 MBF. The average annual growth estimates are based on expected rotation lengths of 80 years, 110 years, and 140 years for high, medium and low sites, respectively. These rotation lengths are based on the point where 95 percent of culmination of Mean Annual Increment (MAI) is reached (Appendix H, USDA Forest Service, 1991d). If rotation lengths are significantly increased, annual growth for timber stands would be expected to decrease.

Although log quality in second-growth stands is expected to be lower than in existing overmature stands, total yield per acre would be higher. For example, a 100 year-old managed stand on a “medium” site would yield 37 MBF per acre (USDA Forest Service, 1991b), as opposed to the 22 to 24 MBF per acre estimated on the old-growth forest acres to be harvested. The lower quality would be reflected in reduced log grades as a result of smaller diameter logs and less knot-free wood.

The development of roads to access the volumes in each alternative would result in losses of productive forest land. Table 4-13 displays the number of acres that would be used for permanent roads and temporary facilities. Temporary facilities include temporary spur roads and landings that will result in at least temporary loss or reduced growth potential. Alternative 3 would result in the most loss of productive acreage (157 acres), and Alternative 5 the least (116 acres). As a percentage of the number of acres being harvested this would equate to eight percent for Alternative 2, nine percent for Alternative 3, eight percent for Alternative 4 and seven percent for Alternative 5.

Forest Health

Each alternative will have differing effects on the amount of area harvested and will therefore have differing effects on forest health. However, differences among the action alternatives are probably not significant. For those areas unharvested in each alternative, factors such as windthrow, dwarf mistletoe, and decay fungi would continue to play a major role in the health and regeneration of timber stands. These same conditions would be expected to continue under Alternative 1, the No Action Alternative. Specific areas experiencing Alaska-cedar decline will probably expand, unless harvested; and net growth will be negative. Areas such as the slope facing the Wrangell Narrows would continue a classic break-up of stand structure, with a high incidence of windthrow, dead tops, dwarf mistletoe, decay fungi, and defoliators. Alternative 2 provides the highest level of treatment in this portion of the South Lindenberg area, but only covers a small portion of the area affected.

Table 4-12
Incremental Annual Volume Growth by Alternative

Alternative	Vol. Growth (100 Cubic Ft)	Vol. Growth (MBF)	Cubic-Ft/ Ac/Yr	BF/ Ac/ Yr
Alt 1	0	0	0.0	0
Alt 2	1,720	761	99.2	439
Alt 3	1,737	767	100.7	445
Alt 4	1,804	798	97.4	440
Alt 5	1,725	762	99.9	441

Table 4-13
Commercial Forest Acres Affected by Road Construction and Landings

Alternative	Permanent Roads (Acres)	Temporary Roads (Acres)	Total (Acres)
Alt 2	97	43	140
Alt 3	113	44	157
Alt 4	101	41	142
Alt 5	80	37	116

The second-growth forests that replace the old-growth stands will undergo a change in the type of damage to be expected. Windthrow, decay fungi, and dwarf mistletoe would probably have minimal impact on these stands, at least in the first decades. Defoliating insects and porcupines could be expected to be increasingly evident among young-growth stands. Areas with group selection harvests could suffer some growth loss due to dwarf-mistletoe, if there is an adjacent infected overstory.

Windthrow

Harvesting timber stands adjacent to uncut timber stands creates the risk of windthrow along the unharvested edge of these units. Undisturbed timber stands have reached a certain degree of wind stability and tend to rely on each other to keep the main force of the wind above the forest canopy. However, once a stand is opened up through harvesting or natural factors, the wind is able to exert its full force against the stand edge, resulting in the stand becoming more susceptible to windthrow. Based on the effect of previous harvest within the South Lindenberg area, we can expect a certain amount of windthrow along uncut timber edges, especially along the leeward side of units. Windthrow will likely extend between 100 to 200 feet into the uncut stand. Not all trees in this area are likely to fall; the remaining standing trees tend to act as a wind buffer for the remainder of the uncut stand. The stand edge can be expected to stabilize after 10 to 20 years.

Each alternative would vary in the amount of perimeter exposed to storm winds that normally blow from the south to southeast. The number of acres potentially affected is largely a function of the amount of unharvested timber edge (assuming a 100-ft distance into the stand from the edge). Alternative 5 shows the least edge with 3.1 miles (37 acres). Alternatives 3 and 4 are intermediate with 3.6 (43 acres) and 4.0 miles (48 acres), respectively. Alternative 2 with 5.3 miles (63 acres) of exposed perimeter shows the most risk due to windthrow. These amounts exclude harvest boundaries with low-volume stands and low-risk edges (southeast, south, and southwest edges). Group selection perimeters are considered low risk and not included.

The effect of wind was considered during the layout of harvest units to mitigate the potential effects of windthrow on adjacent stands. Where practical and logical, unit boundaries are located along windfirm boundaries, such as previously-harvested units, muskegs, non-commercial forest, existing blowdown openings, and rock outcroppings. Because Alternative 2 relies primarily on cable logging, uncut timber adjacent to harvested stands are subject to possible windthrow. Potential harvest units downwind (and upslope) from cable units were included in the unit pool to minimize the amount of exposed timber perimeter.

Cumulative Effects

Most of the South Lindenberg Peninsula, as well as most of Kupreanof Island, continues to be designated in the Draft Forest Plan Revision for intensive development to maintain industrial wood production. Management Area S-13, which includes VCU's 437 and 439 would primarily be managed for even-aged management with clearcutting as the major harvest prescription. The areas facing the Wrangell Narrows in Management Area S-16, which includes VCU's 447 and 448 would continue to be managed with an emphasis on visual quality while continuing forest management, using group selection or smaller clearcut openings.

The Draft Forest Plan Revision (USDA Forest Service, 1991b) projects that 32 percent of Management Area S-13 and 24 percent of Management Area S-16 would be scheduled for harvest over the planning horizon (160 years). The percentage of tentatively suitable CFL in the South Lindenberg Area is 36 percent. Although these Management Areas include other areas in VCU's outside the South Lindenberg Area, this percentage is a rough indicator of how many acres could ultimately be converted to second-growth stands over the Forest Plan planning horizon. The timing and extent of such harvests would be the subject of continuing analysis and depend on future Forest Service management goals. Currently about 15 percent of the suitable CFL and seven percent of the land area has been converted to second-growth stands. After implementation of this project, second-growth stands would comprise about 19-20 percent of the suitable CFL and 10 percent of the land area (Table 4-4).

Although 17,706 acres in the South Lindenberg area are currently suitable for harvest, there are conditions that would prevent these acres from being harvested. Timing of harvests, especially in the seen areas from Wrangell Narrows would need to take into account the number, size, dispersion, and growth of second-growth stands. Areas managed for old-

growth also would tend to reduce the total amount of acres that would ultimately be harvested.

The National Forest Management Act of 1976 requires that an area be regenerated within five years of timber harvest. An area is certified as regenerated when a Forest Service silviculturist determines that an area is adequately stocked with desirable tree species.

Mitigation and Monitoring

Regeneration is the process of establishing a new crop of trees on harvested areas, usually by natural seeding from surrounding timber stands or by hand planting. Natural seeding, or restocking, is usually adequate in Southeast Alaska, but there are situations when hand planting may be necessary or desirable.

Planting is generally recommended when:

- a certain species is desired and there is no proximate seed source,
- when plant cover is desired to decrease erosion, or
- to reduce the time required for natural regeneration.

Proposed prescriptions for harvest units in the South Lindenberg area specify natural regeneration to restock most clearcut-harvested stands. Local experience on the Petersburg Ranger District indicates that adequate stocking of conifer seedlings is expected following harvest. Previously harvested units in the South Lindenberg area show an abundance of regeneration and, with the exception of the most recently-harvested stands, have all been certified as adequately stocked. Several harvest units have been identified where successful regeneration could be a concern. These concerns are:

- harvesting may release competing vegetation of salmonberry and alder, requiring planting of Sitka spruce; and

- Alaska-cedar and western red cedar regeneration has been identified as uncommon in the western hemlock/Alaska-cedar/blueberry plant association.

Artificial regeneration of Sitka spruce and western red cedar by hand planting is proposed for units 2, 11 and 12. Tree seedlings would be interplanted among the natural regeneration at a 25 foot by 25 foot spacing. The following units will need to be monitored to determine if interplanting of Alaska-cedar is needed: 2, 4, 19, 20, 24, 28, 31, 44, 55, 56, 62, 65, 66, 68, 69, 85, 93, 96, 106, 109, 125, 128, 129, 133, 134, and 136.

Natural regeneration often results in overstocked stands and requires precommercial thinning in order to control stocking. Precommercial thinning practice is the systematic removal of standing live trees in a recently regenerated timber stand. Trees are removed between the ages of 15 and 30 to stimulate the growth of remaining trees. Trees are cut that would otherwise die through competition, which concentrates growth on fewer, larger, and physiologically more efficient trees. Other objectives of thinning may include control of species composition, increasing windfirmness, increasing forage, or for aesthetics, recreation or other purposes (Ruth and Harris, 1979). Where precommercial thinning is prescribed, stocking would be reduced to between 200 to 300 trees per acre, leaving a species composition of approximately equal numbers of Sitka spruce and western hemlock intermixed with some Alaska-cedar or western red cedar.

Precommercial thinning would be done approximately 20 years after harvest and is dependent upon site, stocking, and possibly other resource needs. All units are recommended for precommercial thinning. Because of budget constraints, not all harvested areas would be precommercially thinned. Priority is given to units that have the highest potential for timber growth. Table 4-15 lists the acres of high and secondary priority for precommercial thinning by alternative. The actual number of acres requiring precommercial

thinning may vary from this estimate, based upon a determination by Forest Service silviculturists at the time of treatment.

Table 4-14
Cumulative Second Growth by Alternative Following the Proposed Harvest in the South Lindenberg Area

Alternative	VCU	Acres Suitable CFL	Percentage of Suitable CFL	Acres CFL	Percentage of Total CFL (%)	Percentage of Total Land Area (%)
Alt 1	437	2,154	23.5	2,860	20.7	12.1
	439	768	13.6	985	12.7	6.9
	447	296	5.5	382	4.8	2.2
	448	27	3.3	33	2.2	1.2
	Totals	3,245	15.5	4,260	13.8	7.3
Alt 2	437	2,847	31.1	3,554	25.7	15.0
	439	1,358	24.1	1,574	20.4	11.0
	447	726	13.6	812	10.3	4.6
	448	27	3.3	33	2.2	1.2
	Totals	4,958	23.7	5,973	19.3	10.2
Alt 3	437	2,754	30.1	3,460	25.0	14.6
	439	1,525	27.0	1,742	22.5	12.2
	447	637	11.9	723	9.2	4.1
	448	27	3.3	33	2.2	1.2
	Totals	4,943	23.7	5,958	19.3	10.2
Alt 4	437	2,879	31.4	3,585	25.9	15.1
	439	1,643	29.1	1,860	24.1	13.0
	447	478	8.9	564	7.1	3.2
	448	27	3.3	33	2.2	1.2
	Totals	5,027	24.0	6,041	19.5	10.4
Alt 5	437	2,725	29.7	3,431	24.8	14.5
	439	1,578	28.0	1,795	23.2	12.6
	447	617	11.6	703	8.9	4.0
	448	27	3.3	33	2.2	1.2
	Totals	4,947	23.6	5,961	19.3	10.2

Suitable CFL totals 20,952 acres
Commercial forest land totals 30,932 acres
Total land area not covered by water equals 58,344 acres

Table 4-15
Priority of Precommercial Thinning Acres by Alternative

Alternative	High Priority Acres	Low Priority Acres	Total Acres
Alternative 2	1,056	673	1,730
Alternative 3	1,162	563	1,721
Alternative 4	1,127	684	1,811
Alternative 5	1,128	595	1,723

Wetlands

Direct disturbance to wetlands is expected to result from both timber harvesting and road building, although the total wetland area impacted under any alternative is not extensive

(Tables 4-16 and 4-17). The impacts from timber harvest will occur primarily in forested wetlands and are generally short-term, due to the regeneration of vegetation anticipated in the logged areas. Longer-term impacts will result from new road construction in forested wetlands and in mixed forest-muskeg wetlands. The types of potential impacts to wetlands from implementation of the action alternatives include: 1) loss of wetland vegetation, 2) erosion and increased sediment loading, 3) loss of floodflow modulation capability, 4) loss of wetland wildlife habitat, and 5) loss of sensitive plant species habitat.

Loss of Wetland Vegetation

Loss of wetland vegetation would be primarily a temporary impact on forested and mixed forest-muskeg wetlands located within proposed harvest units. Over time a forested community will reestablish itself in clearcut areas, although some changes in the community may occur, such as the loss of sphagnum cover. However, sphagnum patches within forested wetlands are generally small and infrequent in the South Lindenberg area, and harvesting in mixed forest-muskeg wetlands where sphagnum coverage is more extensive will impact less than one percent of this wetland type. In the forested wetlands, timber harvesting will also impact less than one percent of their total area. Therefore, loss of vegetation is not expected to be a major impact. Total area of wetland vegetation cleared would be greatest under alternatives 2 and 3 and smallest under Alternative 4.

Table 4-16
Area of Wetland (Acres) Within Proposed Harvest Units by Alternative

Wetland Type	Total Acres of Wetland in South Lindenberg Area	Alternative 1	2	3	4	5
Mixed Forest-Muskeg	13,016	0	28	28	20	21
Coniferous Forest	2,977	0	72	73	49	69
Muskeg	3,482	0	7	7	7	7
Subalpine	4,653	0	1	1	1	0
Total	24,128	0	108	109	77	97

Table 4-17
Miles of Temporary and Development Roads Proposed to be Located in Wetlands, by Action Alternative

Wetland Type	Alternative 2 T	Alternative 2 D	Alternative 3 T	Alternative 3 D	Alternative 4 T	Alternative 4 D	Alternative 5 T	Alternative 5 D
Mixed Forest-Muskeg	0.3	2.8	0.4	3.2	0.4	3.2	0.2	2.0
Coniferous Forest 0.5	0.6	0.5	1.1	0.3	1.1	0.2	0.8	
Total	0.8	3.4	0.9	4.3	0.7	4.3	0.4	2.8

T - Temporary roads that will not be maintained beyond the South Lindenberg harvest.
D - Development roads that will be maintained for future use.

There would be both temporary and permanent losses of wetland vegetation in the areas where roads are constructed. Temporary losses associated with construction staging areas and temporary roads are expected to be minimal and natural revegetation will occur rapidly. Permanent losses of wetland vegetation will occur where fill is placed in wetlands to form the road foundations. Implementation of alternatives 3 or 4 would result in the greatest

permanent loss of wetland vegetation from road construction. Alternative 5 would have the least impacts of the action alternatives.

Erosion and Increased Sediment Loading Into Wetlands

Timber harvest activities can potentially increase sediment loads in runoff from harvest areas through erosion of areas where vegetation has been cleared, soil disturbance by heavy equipment and log skidding, road construction and use, and construction of drainage ditches. The potential for increased sediment loading is highest in wetlands located in, or directly below harvest units, particularly those units that are located on steep slopes in which clearcutting techniques are employed. Sediment yield from timber harvest areas generally decreases quickly following regeneration of vegetation. Roads are typically a greater source of sediments because, unlike harvest areas, permanent roads do not revegetate and there is often sustained erosion with continued use and long-term degradation of the road bed.

The South Lindenberg wetland types most important in accomplishing the function of sediment retention are 1) the muskegs located in stream valleys and near tributaries below sites prone to landslides or mass wasting, and 2) forested wetlands that occur near the foot of steeper slopes or in riparian zones. Since none of the action alternatives are expected to alter more than seven acres of low-lying muskeg wetland, a minimal amount of floodplain muskeg area would be lost. Much of the harvest in forested wetlands would occur adjacent to Class3 streams where there are no protective buffer areas. This could result in a temporary increase in sediment loading of wetlands and streams downstream from the harvest areas that would decrease as vegetation reestablishes. The smallest area of forested wetland would be impacted under Alternative 4, while there is little difference in area among alternatives 2, 3, and 5. Impacts to mixed forest-muskeg wetlands would be greatest under alternatives 2 and 3. The potential for impacts due to road construction would be greatest under alternatives 3 and 4, which have the greatest length of road proposed in wetland areas.

Loss of Floodflow Modulation Capability

There is little development on the Lindenberg Peninsula and flooding of man-made structures has not been a significant problem historically. Therefore the changes in floodflows that may result from timber harvesting and road building activities are not expected to impact downstream development. However, slightly higher peak stream flows and greater flood volumes may result from filling wetlands for road building. This can increase the likelihood of downstream channel erosion, channel blowout, and sediment loading of streams, with associated impacts to fish and wildlife habitat in downstream areas, but these types of impacts are expected to be minimal.

Muskegs perform important wetland functions, such as sediment retention and floodflow modulation

Muskeg and mixed forest-muskeg wetlands are generally the most valuable wetland types for slowing floodwaters in Southeast Alaska. Road building will eliminate only minor areas of muskeg, therefore none of the alternatives are expected to significantly impact floodflow attenuation in muskegs. Impacts to mixed forest-muskeg wetlands from road construction are expected to be greatest under alternatives 3 and 4 and least under Alternative 5.

Loss of Wetland Wildlife and Fish Habitat

Losses of wildlife habitat in forested wetlands and mixed forest-muskeg wetlands are expected to be largely temporary due to the regeneration of vegetation in harvest areas. Minor permanent losses in all types of wetlands are associated with road construction and ongoing road use. Impacts associated with roads include increased disturbance and displacement of species that are not tolerant of human presence and disruption of wetland migration corridors. No road construction is proposed for lowland floodplain wetlands or estuaries, so minimal impacts to fish and wildlife habitat are expected in these areas. Negative impacts to populations of most species that utilize wetlands in the South Lindenberg area are expected to be minimal.

Loss of Sensitive Plant Species Habitat

The muskeg and mixed forest-muskeg wetlands of the South Lindenberg area support at least one plant species (*Platanthera chorisiana* or choris' bog orchid) that occurs on the Alaska Region Sensitive Species List (USDA Forest Service, 1994a). Road building will eliminate some individual specimens as well as potential habitat for this species. In addition to direct elimination of mixed forest-muskeg wetland, roads may alter existing patterns of surface flow and potentially impact sensitive plant species due to changes in hydrologic conditions. However, there is extensive muskeg and mixed forest-muskeg wetland in the South Lindenberg area and road construction is expected to impact relatively little area of these types of wetlands. Road lengths through mixed forest-muskeg wetlands are greatest under alternatives 3 and 4. Alternative 5 would be expected to cause the least impact to sensitive plant species from road construction.

Cumulative Effects

Few long-term cumulative effects are expected for the forested wetlands in the South Lindenberg area, due primarily to the regeneration of the vegetation. Because there is some permanent loss of muskeg and mixed forest-muskeg wetlands from road building activities associated with past and future timber sales, there may be some cumulative effects with respect to the loss of floodflow modulation. Sediment accumulation in wetlands from past and future timber harvesting and ongoing road use may reduce the overall sediment retention capabilities of the South Lindenberg wetlands and result in negative impacts to the water quality of streams in the area. No other cumulative effects on wetlands are expected in the South Lindenberg area due to timber harvesting.

Mitigative Measures and Monitoring

Disturbance to wetlands located on steep slopes has been minimized to limit erosion in these areas. Selective harvesting and/or retention of understory vegetation in wetland areas that are harvested will reduce erosion. Following timber harvest, stabilization of disturbed areas will be accomplished by leaving slash on the ground and by ensuring that vegetation rapidly recolonizes the harvested areas. Revegetation is not expected to be a problem in any of the proposed harvest units but ongoing monitoring of plant growth in wetland areas within harvest units should be conducted to indicate areas that may need fertilization, stabilization, or other actions. Under circumstances where timber harvest occurs on erosion-prone slopes above wetlands, buffer strips left above wetlands and below clearcuts will reduce sediment loading into the wetlands.

Proper road design and implementation of best management practices (BMPs) will minimize road-related erosion in wetlands. Installing adequate sizes and numbers of culverts is critical to maintaining existing hydrologic conditions in wetlands adjacent to new roads. Erosion control measures such as water bars and sedimentation basins will mitigate the erosion effects of roads on wetlands. In addition, where wetlands are adjacent to roads or harvest units, disturbance should not extend beyond the road right-of-ways and harvest units.

Wildlife

Timber harvest activities proposed for the Lindenberg Peninsula would alter existing wildlife resources through the loss and fragmentation of old-growth forest habitat and the building of roads to access harvestable timber. The following sections identify potentially significant impacts to wildlife and wildlife habitat resulting from the proposed project and proposed mitigation measures.

General Impacts to Wildlife Resources

Species of concern were those considered most likely to suffer population viability problems from removal and fragmentation of old-growth forest and the building of roads to facilitate timber harvest. Priority was given to assessing impacts on species that (a) require large home ranges, (b) have restrictive habitat requirements, or (c) are adversely affected by habitat fragmentation. Species considered in detail in this section include Sitka black-tailed deer and marten. (Alexander Archipelago wolf, Queen Charlotte goshawk, and marbled murrelet are addressed in detail in the TES wildlife section of the EIS.) Species considered to be not as vulnerable to loss and fragmentation of old-growth forest and construction of roads, and for which a less intensive evaluation was therefore made included some raptors (red-tailed hawk, sharp-shinned hawk, osprey, and bald eagle), blue grouse, great blue heron, cavity-nesting birds (e.g., red-breasted sapsucker, hairy woodpecker, and brown creeper), and small mammals. Black bear (which are habitat generalists) and river otter (which are expected to be protected by the streamside buffers discussed in the Fisheries section) are considered only to the extent of analyses of habitat capability and predicted carrying capacities. In overview, general impacts to wildlife resources are expected to occur in three areas: loss of old-growth characteristics, increases in forest edge, and construction of roads.

Loss of Old-Growth Characteristics

Under the proposed Draft Forest Plan Revision (USDA Forest Service, 1991b), harvested areas in the project area are to be managed on an approximately 100-year rotation. Because this is less than the time required for stands to regain some old-growth forest habitat characteristics, the capacity of the Lindenberg Peninsula and Kupreanof Island to support wildlife with old-growth requirements would be permanently reduced. In addition, timber harvest alters the disturbance regime of the landscape and increases forest fragmentation. Habitat fragmentation can be defined as the increase in isolation and the decrease in size of old-growth forest patches. Habitat fragmentation is a particular threat to species that select for "forest interior conditions" and those for which the presence of habitat edges is detrimental. (See Chapter 4 Biodiversity Section for detailed discussion of fragmentation.)

Species with large home range requirements will have populations limited by the size of remaining forested areas, if these species are primarily dependent on old-growth forest habitat. Where the area of forest is smaller than that required by a species' home range needs, the species may not persist. In the South Lindenberg project area, species with large home range requirements that depend on old-growth habitat include marten and Sitka black-tailed deer (addressed in this section), Alexander Archipelago wolf, the marbled murrelet, and Queen Charlotte goshawk (the latter three addressed in the TES animals section).

Effects of Habitat Edge

Timber harvesting and road construction result in the formation of edge habitat. Edge effects in forested areas may include changes in microclimate (temperature, wind, moisture, light intensity), increases in shade-intolerant vegetation, the introduction of weedy exotic plant species and tree pathogens, and increases in windthrow of trees. Edges were formerly considered to be generally beneficial to wildlife, but this thinking was driven largely by emphasis on game management. Populations of forest interior birds and mammals are

currently of greater conservation concern because edge habitat already makes up a large proportion of wildlife habitat of many regions.

Nest predation has been one of the primary subjects of studies investigating edge effects. Many studies have observed that bird populations have declined in fragmented landscapes, although most of these studies have focused on neotropical migrants in forests of eastern North America. Higher rates of nest predation and nest parasitism near habitat edges are the most frequently cited explanations for the decline of bird populations in fragmented landscapes (Paton, 1994). Corvids (jays, crows, and ravens) are important nest predators in boreal forests and can significantly affect the nesting success of birds. Corvids often follow roads to look for potential prey (Paton, 1994), and three species are common residents of Southeast Alaska: common raven, northwestern crow, and Steller's jay. The expected impacts on marbled murrelets of increases in forest edge due to timber harvest and road construction are discussed in the TES Wildlife section.

Clearcutting creates an edge habitat zone or "ecotone" that extends approximately 200 feet into adjacent old-growth stands, due to vegetative response to increased light (Kirchhoff, 1993). Although browse species favored by Sitka black-tailed deer may increase near these edges, their nutritional value is lower than that of species growing beneath the forest canopy. In addition, windthrow of trees along the forest edge may impede deer locomotion and further reduce use of these edges (Kirchhoff et al., 1983). When clearcuts mature into closed-canopy second-growth, effects of the edge change, and increased shading decreases understory production in adjacent stands (Kirchhoff, 1993). Based on an analysis of alternative harvest patterns, Kirchhoff (1993) concluded that harvest layouts designed to maximize edge habitat were not justifiable in terms of increased habitat capability for Sitka black-tailed deer. Edge effects on deer populations in the South Lindenberg project area are probably more importantly viewed in terms of adverse effects of fragmentation and isolation of old-growth forest habitat patches. These consequences of timber harvest might result in increased vulnerability to wolf predation and human-caused mortality because of increased access to habitat patches created by clearcuts and roads.

Impacts Due to Roads

Expanding the logging road network will result in the edge effects described above, as well as other impacts: (1) construction of the roads will result in mechanical disturbance and removal of habitat, (2) logging truck hauling will result in disturbance, (3) new roads that are constructed will allow humans greater access to more areas of the peninsula on foot or by motorized vehicles, and (4) roads that are constructed near or adjacent to reserve or retention areas may reduce the effectiveness of these areas for protecting wildlife populations.

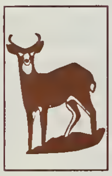
Road Construction

Wildlife most likely to be significantly impacted by the mechanical disturbance of road construction are nesting birds. Birds tend to abandon nest sites when the threat of predation and/or disturbance are perceived to be great. This reduces the probability of successful nesting. As the season progresses and nestlings are present, adult birds have invested a greater amount of time and energy in reproduction and may tend to abandon nests less readily. Because each species has different adaptations and vulnerabilities, each tends to have a different level of tolerance to different types of disturbances. For some species, such as great blue heron and certain raptors, these tolerances are documented to some extent in the scientific literature. For this analysis, birds that have population viability concerns in Southeast Alaska (or throughout their distribution) are of primary concern. They include: Queen Charlotte goshawk and marbled murrelet (addressed in the TES Wildlife section), and great blue heron. Nests of red-tailed hawks and sharp-shinned hawks may also be

encountered during timber harvest or road construction and some nest areas may be abandoned, but these species' populations are expected to be relatively less sensitive to the habitat fragmentation and disturbance as proposed by the project.

Direct mortality of mammals caused by management activities would probably be low, because adults will readily move away from the disturbance, deer fawns are fairly mobile soon after birth, and carnivores can usually move their young.

Logging Truck Traffic



Logging traffic would have minimal impacts on non-TES wildlife in the project area. Dispersal and movements of certain species would be impacted on a periodic basis in the short-term. Some mortality of individual animals, particularly Sitka black-tailed deer, might occur through collisions with vehicles.

Increases in Road Density and Public Use of the Road System

Under all the action alternatives approximately two-thirds of the new roads (also referred to as Forest Development Roads or FDRs) constructed for the South Lindenberg Timber Sale would be developed and operated for long-term land resource management purposes. These new roads would receive constant or intermittent use depending on the timing of harvest. After commercial use of these roads is complete, public use with highway vehicles would be discouraged, off-road vehicle use would be accepted, and hiking and bicycling would be encouraged. This would be accomplished by relying on advisory signs, by using trees and brush to camouflage the road entrance, by creating large ditches or "tank traps" at the entrance to the road, and by allowing alder to eventually close the road (10 to 15 years). Roads could be cleared and reopened in the future for resource management purposes.

Temporary roads (approximately one-third of all new roads under all the action alternatives) would be obliterated (BMP 14.24). These roads would not be reopened in the future and would have vegetative cover within 10 years.

Since off-road vehicles are used more often than cars or trucks by hunters in the project area, road barriers may be ineffective at preventing access on new roads (FDRs. Little or no enforcement of road closures is feasible in the project area.

Most impacts to wildlife due to roads will result from the increased access afforded by roads into formerly roadless and undisturbed areas. Alexander Archipelago wolf, marten, and Sitka black-tailed deer are the species most likely to be susceptible to impacts resulting from increases in road density and associated habitat fragmentation on the Lindenberg Peninsula. Impacts to these species are primarily associated with potential increases in human-caused mortality from legal and illegal hunting and trapping along roads. For some species, such as Alexander Archipelago wolf and marten, these impacts may be more severe than the net loss of suitable habitat lost to timber harvesting.

In addition, wolves in Southeast Alaska are known to make use of logging roads, and they might take advantage of logging roads as convenient travel corridors to access patches of old-growth deer winter range and thus increase their hunting efficiency. Evidence for this is still largely anecdotal; however, if this mechanism is operating on the peninsula, the effects of creating new roads that access most of the remaining undisturbed areas of deer winter range on the peninsula may be significant. By creating islands of traditionally- and predictably-used winter habitat surrounded by travel corridors, deer may become more vulnerable to wolf predation, which might slow recovery of deer populations after severe winters or make it difficult for the population to support hunting by humans.

Marten are relatively easy to trap and therefore vulnerable to overharvest (Strickland and Douglas, 1987). Large home ranges and extensive road networks result in most home ranges being intercepted by roads, resulting in the entire population being vulnerable to harvest

(Flynn, 1992). Cumulative effects of new roads proposed for the South Lindenberg Peninsula, especially with the inclusion of new roads into currently undisturbed portions of the Duncan Creek area and Skogs Creek watershed, could result in all existing marten home ranges being intercepted by roads, thereby making the entire peninsula sub-population susceptible to trapping. There are currently no limits on the number of trappers or numbers of marten allowed to be harvested in the Lindenberg Peninsula, although harvest rates are believed to be currently fairly low.

Access to the existing and proposed road network on the Lindenberg Peninsula is only available by boat, float plane, or by off-loading vehicles at the Tonka LTF. The inconvenience and difficulty of gaining motor vehicle access to roads on the peninsula is likely one of the main reasons that harvest rates of marten are currently low. No change in accessibility to the road network in the South Lindenberg area is expected under the proposed action.

The density of existing roads in the project area is 0.64 mi/mi^2. Predicted road densities (not including temporary roads or accessible shoreline) for the Lindenberg Peninsula as a whole range from 0.78 to 0.87 mi/mi^2 under the various action alternatives (Table 4-18). Predicted road densities including temporary roads and accessible shoreline range from 1.14 to 1.24 mi/mi^2 under the various action alternatives (approximately 60 percent of the shoreline in the project area is assumed to be accessible) (Table 4-18). As will be addressed in the TES Wildlife section on wolves, if roads are closed to motor vehicle use, they can technically be excluded from road density calculations. However, unless these roads are restored to forested habitat, they would remain the primary travel corridors for humans traveling on foot and by off-road vehicles. To allow a full interpretation of predicted conditions, road densities in Table 4-18 are presented with temporary roads included or excluded, and with all shoreline included, only accessible shoreline included, or no shoreline included.

Roads Adjacent to Retention Areas and Wilderness Areas

Roads that enter or are near Wilderness Areas or Retention Areas would compromise the effectiveness of these areas for protecting wildlife. Potential detrimental impacts of roads on nearby protected areas include windthrow, collection of firewood by local residents, legal and illegal hunting of wildlife, increased nest predation, and generally increased human disturbance.

Habitat Capability Model Results

Habitat Capability Models currently utilized in forest-wide and project-level planning are useful tools to evaluate relative differences among management alternatives, although there are limitations in their applicability. Nonetheless, changes in habitat capability for MIS were assessed using such models. Results of suitability simulations apply to the hypothetical implementation of a particular harvest alternative over a relatively short time-period (less than one year). Implementation of a particular harvest alternative converts existing habitat to a clearcut or roaded character. Thus, harvest alternatives *shift* the habitat suitability of the South Lindenberg area, but do not *eliminate* habitat. Acreage of a particular habitat suitability category may increase or decrease, depending upon the suitability of clearcut and second-growth habitat for the particular MIS. Using the shifts in habitat suitability, the changes in the predicted carrying capacity of the South Lindenberg area to support populations of MIS may also be estimated.

Table 4-18

Projected Road Mileage Increases and Road Densities for the Lindenberg Peninsula Under Each Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt.5
Existing Roads in Project Area (*mi*)	58.5				
Shoreline in Project Area (*mi*)	46.4				
Skiff-accessible Shoreline in Project Area (*mi*)	27.9				
Project Area (mi^2)	90.0				
Proposed Development Roads (*mi*)	0	15.5	20.3	18.8	12.4
Proposed Temporary Roads (*mi*)	0	5.4	5.8	5.3	4.6
Road Density (development roads included, temporary roads and shoreline excluded) (mi/mi^2)	0.64	0.81	0.87	0.85	0.78
Road Density (development and temporary roads included, shoreline excluded) (mi/mi^2)	0.64	0.88	0.93	0.91	0.83
Road Density (development roads and accessible shoreline included, temporary roads excluded) (mi/mi^2)	0.95	1.12	1.17	1.16	1.09
Road Density (development roads, temporary roads, and accessible shoreline included) (mi/mi^2)	0.95	1.18	1.24	1.22	1.14
Road Density (development roads and all shoreline included, temporary roads excluded) (mi/mi^2)	1.15	1.33	1.38	1.36	1.29
Road Density (development roads, temporary roads, and all shoreline included) (mi/mi^2)	1.15	1.39	1.44	1.42	1.34

Estimates of carrying capacities were calculated for two pertinent time-periods: a clearcut stage and a second-growth stage (Table 4-19). The clearcut stage reflects habitat conditions for the first 35 years or so following harvest, while second-growth conditions would persist for the remainder of the rotation life. These changes are overestimates of declines in habitat capability because of the nine harvest units that are proposed for partial cutting. The models do not provide suitability indices for habitat changes caused by alternative silvicultural techniques, particularly when the location of the cut is uncertain. One option is to limit the unit size to the extent of the partial cut and treat this territory as a clearcut, but this still fails to address the overall issue of the habitat suitability of a partially-cut area. Another option is to treat the entire unit as a clearcut followed by a second growth stage, as selected herein, but this does overstate the potential loss of habitat capability. The greatest effect of this overestimation would occur with Alternative 3, where eight particular units have a total area of 642 acres but out of which only 102 acres would be harvested. Because the suitability of the partial-cut unit cannot be estimated using current versions of the Forest Service's Habitat Capability Models, it is not possible to quantify the magnitude of the overestimation, and a worst-case approach was utilized here (i.e., assuming the entire unit would be harvested).

Table 4-19

Relative Changes in Predicted Carrying Capacities for MIS in the South Lindenberg Area

MIS	VCU	1995 Baseline Carrying Capacity (#)	Alternative 2 (percent)		Alternative 3 (percent)		Alternative 4 (percent)		Alternative 5 (percent)	
			Clearcut	Second-Growth	Clearcut	Second-Growth	Clearcut	Second-Growth	Clearcut	Second-Growth
Sitka black-tailed deer	437	570	-3.0	-4.1	-3.2	-4.3	-3.5	-4.8	-2.5	-3.3
	439	284	-6.1	-8.3	-6.7	-8.9	-7.5	-10.2	-7.1	-9.6
	447	457	-3.8	-5.0	-4.3	-5.5	-1.3	-1.5	-4.2	-5.7
	Total[1]	1,412	-3.7	-5.0	-4.0	-5.3	-3.3	-4.5	-3.8	-5.1
Alexander Archipelago wolf[2]	Total[1]	4	-3.7	-5.0	-4.0	-5.3	-3.3	-4.5	-3.8	-5.1
marten	437	36	-4.3	-4.9	-4.7	-5.3	-5.0	-5.7	-3.7	-4.2
	439	20	-6.8	-7.7	-8.7	-9.8	-9.6	-10.8	-9.1	-10.3
	447	27	-4.4	-4.9	-5.6	-6.3	-2.2	-2.4	-5.1	-5.7
	Total[1]	88	-4.7	-5.3	-5.7	-6.4	-5.0	-5.6	-5.2	-5.9
black bear	437	43	+1.0	-1.7	+0.9	-2.1	+0.9	-2.3	+1.1	-1.2
	439	26	-1.0	-4.8	-1.3	-6.2	-1.4	-7.1	-1.3	-6.6
	447	31	-0.7	-3.0	-1.1	-5.0	-0.5	-1.5	-0.8	-4.3
	Total[1]	105	-0.1	-2.8	-0.3	-3.9	-0.1	-3.2	-0.1	-3.4
river otter	437	16	-3.9	-3.9	-3.3	-3.6	-4.1	-4.3	-3.7	-3.8
	439	11	-6.7	-6.5	-8.1	-8.6	-8.3	-8.8	-8.3	-8.8
	447	12	-6.8	-6.6	-3.7	-4.6	-3.3	-3.1	-3.2	-4.1
	Total[1]	41	-5.4	-5.3	-4.6	-5.1	-4.8	-5.0	-4.6	-5.1
red squirrel	437	14,644	-3.6	+2.7	-3.7	+3.2	-4.0	+3.4	-3.1	+2.2
	439	8,926	-4.6	+3.8	-5.8	+5.1	-6.7	+6.0	-6.2	+5.5
	447	11,677	-2.9	+2.0	-2.1	+3.1	-1.6	+0.5	-4.2	+3.0
	Total[1]	36,989	-3.4	+2.6	-3.5	+3.5	-3.7	+2.9	-4.0	+3.1
bald eagle	437	26	0	0	0	0	0	0	0	0
	439	15	0	0	0	0	0	0	0	0
	447	14	0	0	-0.2	-0.2	-0.2	-0.2	0	0
	Total[1]	57	0	0	-0.1	-0.1	-0.1	-0.1	0	0
blue grouse	437	1,469	-4.9	-5.4	-5.4	-6.0	-5.7	-6.3	-4.1	-4.5
	439	900	-7.0	-7.7	-9.0	-9.8	-10.3	-11.3	-9.5	-10.5
	447	1,041	-4.5	-4.9	-7.4	-8.2	-2.2	-2.4	-6.5	-7.1
	Total[1]	3,597	-5.0	-5.5	-6.6	-7.3	-5.6	-6.1	-5.9	-6.5
red-breasted sapsucker[3]	437	2,102		-5.8		-6.4		-6.8		4.9
	439	1,203		-8.7		-11.0		-12.8		-11.8
	447	1,465		-5.0		-8.3		-2.7		-7.0
	Total[1]	5,039		-6.0		-7.7		-6.7		-6.9
hairy woodpecker[3]	437	186		-9.4		-10.6		-11.4		-7.9
	439	124		-11.7		-15.6		-17.2		-16.3
	447	156		-9.1		-12.9		-3.5		-12.5
	Total[1]	489		-9.5		-12.1		-9.8		-11.2
brown creeper[3]	437	87		-16.7		-18.1		-18.7		-15.4
	439	122		-15.5		-15.3		-18.1		-16.4
	447	142		-17.7		-20.1		-2.0		-21.6
	Total[1]	361		-16.2		-17.4		-11.4		-17.7

[1] None of the action alternatives encroach into VCU 448, but carrying capacities of VCU 448 are included in the total.

[2] Habitat Capability based solely on the predicted carrying capacity for Sitka black-tailed deer, calculated as presented in Suring and DeGayner (1988). Predicted carrying capacity for all alternatives during all successional stages mathematically rounds-off to 4 wolves. Carrying capacity is not differentiated into separate VCUs because the entire peninsula is required (based on the predicted deer population) to support a single wolfpack.

[3] The Habitat Capability Models for cavity-nesting birds does not differentiate between clearcuts and second-growth stages.

For most MIS, predicted changes in habitat capability due to harvest would be generally less than a 10 percent reduction from the baseline carrying capacity, although the cavity-nesting birds seem to be most sensitive. Nearly 20 percent of the baseline habitat capability is lost for brown creeper, reflective of the importance in the model of old-growth habitat and the equivalent importance of old-growth for timber harvest. The smallest adverse effects of proposed harvest occur for the black bear, with carrying capacities during the second-growth phase being reduced by as much as 3.9 percent. For red squirrel, habitat capability declines during the clearcut stage, but increases relative to current conditions during the later second-growth years because of the greater seed production by conifers during this period.

Species-Specific Impacts

Many of the impacts of the proposed management actions would occur for all wildlife species, as addressed in the previous section. However, some impacts are more specific to particular species. This section addresses those specific impacts to non-TES species (see the TES Wildlife section for species-specific impacts to threatened, endangered, and sensitive species).

Sitka Black-Tailed Deer

Old-growth forest stands that are converted to even-aged stands under 100 - 200+-year harvest rotations would have very low carrying capacity for deer, and the habitat capability for the population would be permanently reduced. Roads built to access harvest areas may cause additional impacts. Roads provide travel corridors for wolves, could increase deer vulnerability to predation, and could also increase human access into deer habitat.

Although the viability of the Sitka black-tailed deer population is not threatened by the proposed management actions, the ability to maintain moderate to high local sub-populations in order to provide enough deer for human harvest depends directly upon the amount of high-volume old-growth forest winter range available and is therefore sensitive to the proposed management actions. A permanent reduction of winter range in the Lindenberg Peninsula may result in higher mortality during severe winters and slower recovery of deer populations after these events. If deer vulnerability to wolf predation increases with increased wolf predation efficiency caused by the construction of new roads and the isolation of remaining old-growth winter habitat, strong predator-prey population oscillations might occur. An additional consideration is that Sitka black-tailed deer show strong site fidelity to their seasonal home ranges and most movements in response to snow accumulation and habitat availability generally occur within the same watershed (Schoen and Kirchoff, 1985). Black-tailed deer in other areas have been known to die of malnutrition rather than travel outside of their familiar home range to search for food (Dasmann and Taber, 1956). Therefore deer within watersheds that become more heavily impacted by timber harvest are likely to experience greater winter mortality.

Reductions in the amount of old-growth forest habitat would have several direct effects upon Sitka black-tailed deer. Clearcut areas provide less nutritious browse (Robbins et al., 1984) that is easily buried by snowfall due to lack of canopy cover. Old-growth forest provides a “litterfall” of arboreal lichens, which are an important winter food source for deer (Stevenson and Rochelle, 1984); these lichens are sparse in second-growth forest stands (Neitlich and McCune, 1995). Clearcuts impede movement of deer if deep snow or slash is present. High-volume old-growth stands that are converted to even-aged managed stands would essentially be lost as suitable deer winter range. Even-aged stands from about 20 years of age to about 160 years of age have low carrying capacity year-round because of their sparse understory. Understory development begins after stands reach approximately 140 years of age, and forage within the stands increases until stands reach 250 to 300 years of age, when old-growth conditions are regained (Kessler, 1984). For stands that are scheduled for 90–125 year harvest rotations, there is predicted to be very low habitat capability for deer to provide stands suitable as winter range would require even longer rotations.

Population objectives for National Forest Lands have been established (and recently updated) by ADF&G as part of a comprehensive management program for Sitka black-tailed deer in Southeast Alaska (Paul, 1994). Population objectives of 1,548 deer are proposed for ADF&G's Wildlife Analysis Area (WAA) 5138, which consists primarily of the Lindenberg Peninsula and additional habitat north of Petersburg Creek along Wrangell Narrows. The action alternatives are predicted to reduce this carrying capacity by a maximum of 75 deer (5.3 percent by Alternative 3 during the second-growth stage). The Forest Service is not required to meet ADF&G objectives for deer.

All action alternatives propose to harvest a substantial amount of the better deer winter range available in the project area, especially in the low-elevation, south-facing slopes north of Duncan Creek. The proposed management actions are not predicted to result in the loss of a viable Sitka black-tailed deer population on the Lindenberg Peninsula, but the model output may underestimate the effects of the proposed actions on the predicted carrying capacity for deer. Project-caused changes in wolf predation, increased human access, and increased hunting success may outweigh the deer population's response to direct habitat loss. If so, the project may have negative impacts on deer that jeopardize the ability of the population to sustain human harvest.

Marten

Marten are one of two species (along with Alexander Archipelago wolf) in the South Lindenberg project area most at risk for population reductions on a local level as a result of proposed management actions. All alternatives propose extensive clear-cutting and road building in the Duncan Creek watershed, which currently represents the largest area of contiguous "good" (HSI > 0.7) habitat for marten according to the habitat capability model used for this project.

According to the habitat capability modeling results, marten populations would be reduced up to six percent due to loss of preferred old-growth forest habitat. The text describing the habitat capability model for marten winter habitat states:

> "..whenever roads are built within 2 mi (3.2 km) of the beach or built less than 2 mi (3.2 km) apart, a high risk exists that unregulated trapping on these roads will result in an overharvest of resident marten. It is assumed, therefore, that as road densities exceed 0.2 mi/mi^2 densities of marten will decrease... [while] At road densities of 0.6 mi/mi^2, marten densities will be reduced by 90 percent due to greatly increased trapping pressure." (Suring et al., 1992c)

Road densities within the project area (not including shoreline access) are currently 0.64 mi/mi^2. At this road density, marten carrying capacity is predicted to be 90 percent less than that derived from the habitat capability model under the assumption of Suring et al. (1992c). However, since the existing and proposed road network on the Lindenberg Peninsula is not directly connected to the nearest community (Petersburg), it is not known whether or not this assumption is valid. If the model predicts a carrying capacity of 88 marten for the project area based on existing habitat capability alone (i.e., ignoring effects due to roads), a 90 percent reduction would mean only nine marten would be predicted to be present when influenced by the presence of roads, independent of any additional trapping pressure facilitated by skiff access.

Sustainability of a marten population in the Lindenberg Peninsula could be threatened by the proposed project. Prey populations may fluctuate following loss of old-growth forest habitat, and marten populations are known to fluctuate in accordance with prey availability. Increased road densities resulting from all action alternatives would result in most marten

territories being crossed by roads; because marten are easy to trap, this would result in vulnerability to overharvest. Movements and dispersal of marten through open areas such as clearcuts are limited; therefore, adequate forested corridors are necessary to ensure exchange of individuals across the landscape. Use of corridors by martens remains untested, and complete reliance on corridors for adequate dispersal may not be effective in maintaining martens throughout the peninsula.

No direct effects to marten are predicted to result from proposed management actions. Direct mortality to marten could conceivably result from a den or nest being destroyed by heavy machinery or logging operations, but the chances of this occurring are slight. Indirect effects of habitat loss and fragmentation caused by the proposed actions might, however, have serious impacts on the ability of marten to maintain a population in the Lindenberg Peninsula if movement and dispersal of marten becomes restricted between suitable breeding territories. In addition, the habitat capability model for marten contains a great deal of uncertainty because very few studies have yet been conducted in Southeast Alaska. Marten in the project area might be primarily dependent upon red squirrel as a winter prey-item. Red squirrels are territorial mammals whose population densities are regulated by the quality of forested habitat types available. Logging of old-growth would reduce red squirrel populations during earlier stages of ecological succession. Clearcuts and young second-growth would have near-zero seed production for at least 40 years (until conifers begin to bear cones). Marten carrying-capacities may decrease if red squirrel populations decline during this time period. Seed production by conifers would then increase slowly after an approximately 40-year period. At this "young growth sawtimber" successional stage, habitat capability for red squirrel is greater than the baseline conditions, and this could possibly benefit marten populations, assuming marten utilize these stands.

Adequacy of Retention Areas to Sustain Marten

The recommended size for small conservation areas to protect old-growth-dependent species such as marten is 1,600 acres (6.5 km^2; 2.5 mi^2), but old-growth forest habitat (including volume classes 4-6 on the Lindenberg Peninsula) is required to make up only 800 acres (3.25 km^2; 1.25 mi^2) of this area (Suring et al., 1992). The average size of a male marten's home range in years when the food supply is at moderate levels is 6.2 km^2 (2.4 mi^2), according to data for Chichagof Island martens. Because home ranges of individuals of the same sex do not overlap, these areas would provide habitat for only one male and perhaps one to two female martens, depending upon the quality of marten habitat represented within the HCA. Old-growth area requirements for these small HCAs were only intended to provide temporary habitat for marten (Suring et al., 1992). In years when prey numbers are low, small HCAs are not predicted to be large enough to encompass either a male or a female marten's home range, even if all of the HCA was comprised of old-growth forest habitat; TLMP-mandated "retention" is even less area. The amounts of territory proposed for small WRAs, even in compliance with HCA and retention-strategies, may not be sufficient to sustain marten populations within the South Lindenberg area.

The medium WRA proposed for the southern tip of the Lindenberg Peninsula has a total area of 48.9 km^2 (18.8 mi^2) (see Wildlife Mitigation section below). Total area of old-growth forest of volume classes 4 through 6 (no Volume Class 7 habitat is present on the peninsula) for the medium WRA is 21.3 km^2 (8.2 mi^2). Other habitats encompassed in the medium WRA (muskeg, alder mountain slopes, and forest-muskeg) would have "unsuitable" to "below-average" habitat capability for marten. Medium HCAs are intended to provide habitat to support five female marten in years of poor prey availability (Suring et al., 1992), based on the total area of old-growth forest of volume classes 4-6. This area (8.2 mi^2) is slightly less than the area required for five average female marten home ranges ($1.7 \times 5 = 8.5$ mi^2) in a year with moderate prey abundance (Flynn, 1991). Therefore, the MWRA might be inadequate to support five female marten in years of prey scarcity from a home range basis

only. Martens in Southeast Alaska may require a larger proportion of the higher volume classes within their home range, as indicated in the studies on Chichagof Island where marten show a greater-than-expected preference for Volume Class 6 forest habitat. Prey densities may be higher in these stands. Of the proposed medium WRA, only 10.4 km^2 (4.0 mi^2) is comprised of old-growth forest in volume classes 5–6. In addition, marten existing within the medium WRA are vulnerable to unregulated trapping since the WRA is bordered by skiff-accessible shoreline along most of its perimeter. Moreover, roads located within or bordering the small and medium retention areas may inhibit natural dispersal of martens, especially if cover has been removed within the surrounding forest by clear-cutting or salvage logging.

The various WRAs are theoretically placed close-enough together that they can be reached by individual dispersing martens. Adequate dispersal and exchange of martens between the WRAs on Lindenberg Peninsula and the rest of Kupreanof Island depends upon numerous uncertainties: (1) that breeding individuals in the WRAs would be productive enough to provide adequate numbers of dispersing individuals, (2) that corridors of sufficient quality are provided for throughout the planning process for all future management actions occurring on the peninsula, (3) that corridors are used by marten, (4) that corridors would not change in effectiveness over time, and (5) that dispersing marten do not experience excessive mortality.

Sharp-Shinned and Red-Tailed Hawks

Raptors such as the sharp-shinned hawk and the red-tailed hawk were frequently observed in the project area, and one red-tailed hawk nest was discovered. Several other nests are expected to exist in or near proposed harvest units, based on observations of aggressive territorial behavior; however no nests were located. Nests of these species might be impacted by disturbance or may be destroyed during timber harvest or road construction, but these species' populations are believed to be less sensitive to habitat fragmentation and disturbance than other raptors (e.g., Queen Charlotte goshawk) and therefore would probably be adequately protected if sufficient area is provided for goshawk.

Blue Grouse

Proposed management actions are not expected to threaten the existence of sustainable populations of blue grouse in the project area, although sufficient data concerning the habitat relationships of blue grouse specifically for Southeast Alaska are lacking. Most studies of blue grouse have emphasized the importance of open areas as preferred breeding habitat. From a study in Southeast Alaska (Doerr et al., 1984), blue grouse in Southeast Alaska appear to be well-adapted to forest environments that lack disturbance by fire and posses great quantities of old-growth forests. The amount of clear-cutting proposed for the Lindenberg Peninsula is expected to cause only minimal impacts to grouse since they are a relatively common and widespread species. Blue grouse are not expected to be impacted by increased road access because hunting pressure is not likely to be detrimental to the peninsula's population.

Great Blue Heron

The great blue heron is at the northernmost limit of its range in the Tongass National Forest, and very few nests have been documented in Southeast Alaska. Two solitarily-nesting birds were found in proposed harvest units 4 and 6. Nest relocation due to displacement by disturbance should not be a problem due to the small number of birds and large number of potential nest sites (Walters, 1994). It is unknown whether individual birds would renest if nests are destroyed. There is evidence that this species is very vulnerable to increased mortality of young from exposure and predation and/or nest desertion resulting from nest

disturbance. Proposed Standards and Guidelines for the Tongass provide for the protection of great blue heron nest sites (see Mitigation Section). It is not certain if the mitigation measures will be adequate to reduce disturbance to these nests sufficient to insure successful nesting. However, lack of nesting habitat may not be a factor limiting great blue heron numbers in the area. It is possible that the rareness of the species in the project area could be related to its being on the edge of its range or could be resulting from competition for some resource. Until more is known about the species' habitat requirements in the area, it is assumed that these mitigation measures will be adequate to insure the maintenance of nesting great blue herons in the Lindenberg Peninsula. The project is not expected to result in long term impacts to the species.

Cavity-Nesting Birds

Birds that nest in natural holes or holes excavated by other animals or birds are termed "cavity-nesters." These species often rely on the existence of standing dead trees ("snags") or live trees that have decaying or rotten heartwood. Cavity-nesting birds would be impacted by the project due to the harvest of suitable nesting, foraging, and roosting trees. Road construction and/or increased disturbance are not predicted to have impacts on cavity-nesting birds severe enough to jeopardize their populations. Clearcuts and managed second growth stands have no habitat value for cavity-nesting birds unless enough suitable dead and live trees are left standing within them to provide for them. Single large snags or even groups of trees left standing after clear-cutting are at high risk of being blown down by wind in Southeast Alaska. There is likely to be a direct relationship between the amount of reserve clumps retained and the suitability of habitat for cavity-nesting species. Therefore, the more reserve clumps left within the harvested units, the better the habitat would be for these species.

Black bear utilize a variety of habitats in Southeast Alaska

Black Bear

Black bear in Southeast Alaska are not known to be limited by availability of old-growth forest habitat. Many food items used by black bear are shade intolerant and a large amount

of foraging occurs in forest openings, avalanche slopes, estuaries, and young clearcuts from about 5 to 20 years of age. Second-growth stands from about 40 to 150 years of age tend not to be used by black bear due to lack of available forage. Old-growth forest habitat is required by black bear for providing the cover used for den sites, but availability of suitable den sites in the project area is not believed to be limiting to the peninsula's black bears.

Black bear in the Lindenberg Peninsula may be adversely affected by the increase in road density proposed under the action alternatives. Roads may increase human-caused bear mortality through legal and illegal hunting.

None of the action alternatives is predicted to result in significant impacts to the peninsula's black bear population. Alternatives 2 and 5 that do not propose the building of a road into the Skogs Creek watershed are more likely to insulate bear populations from any impacts that may result from increases in road density.

Consequences Specific to Alternatives

Current land-use designation for the South Lindenberg area is almost entirely directed towards timber production, and timber harvest activities are generally incompatible with conservation of old-growth dependent wildlife habitat. The balance that is struck between conservation and resource use is of much larger scope than the South Lindenberg EIS. Within the limited context of South Lindenberg area wildlife resources, fragmentation of the forested habitats have been minimized in selection of some of the timber harvest alternatives through clustering of harvest units. Such clustering leaves blocks of forested habitat within the South Lindenberg area untouched by road or timber harvest activities. Under the currently-configured harvest alternatives, examples of large unharvested areas include the Skogs Creek watershed for alternatives 2 and 5 and the Medium Wildlife Retention Area (Action Alternatives 3, 4, and 5). Particular effects of each of the management alternatives are discussed below.

Alternative 1

Existing conditions for Sitka black-tailed deer are sufficient to support a resident population of deer, but wolf predation is believed to inhibit the recovery of the deer population to historical densities. Previous clearcutting has reduced the habitat capability for deer, and roads may be facilitating continued predation. Even with no further harvest actions, a mitigative measure of permanent abandonment and revegetation of existing roads may be desirable if roads are resulting in increased wolf predation.

Existing conditions on the peninsula are conducive to sustaining resident marten, due to the large undisturbed and roadless areas in the Duncan Creek, Skogs Creek, and Colorado Creek watersheds. Existing road densities of 0.64 mi/mi^2 (not counting skiff-accessible shoreline) for the entire project area are potentially adverse for marten, but may be compensated for by these large roadless areas. Contiguous blocks of volume class 6 old-growth habitat is relatively rare except in the area on the south-facing slopes of Duncan Creek. This area may have the highest value to marten in the peninsula. It is highly likely that, with no further habitat alteration, marten populations would be sustained for the long-term on the Lindenberg. Overall, this alternative would best protect wildlife populations in the project area.

Alternative 2

Alternative 2 does not propose the clear-cutting or construction of a road in the Skogs Creek watershed; however, Alternative 2 proposes a road (Road 43518) into the proposed medium WRA at the southern end of the peninsula to harvest high value Volume Class 6 habitat in the Colorado Creek drainage. This road would fragment deer winter range in the proposed medium WRA and reduce the effectiveness of this area to protect both deer and marten from

impacts related to road access. In addition, this alternative proposes some harvest within two of the small Wildlife Retention Areas (WRAs 437 and 439). (See Mitigation later in this section and in TES Species section of Chapter 4 for a detailed discussion of proposed WRAs.) Overall, approximately 20 percent of the Volume Class 6 old-growth would be harvested, which is the highest amount of all the alternatives. The road density would be 0.88 mi/mi^2 (including both development and temporary roads, and excluding shoreline), which is the second lowest of the action alternatives. Impacts on TES species would be intermediate among the action alternatives. Overall, this alternative would be worse than alternatives 1 and 5, but better than alternatives 3 and 4, for protecting wildlife on the peninsula.

Alternative 3

Alternative 3 proposes to build a road into, and harvest within, the currently undisturbed Skogs Creek watershed. It proposes harvest within two of the small WRAs, but not within the medium WRA. Under this alternative, a large amount of clear-cutting would take place in Volume Class 6 forest habitat west and north of the Tonka LTF. Overall, about 14 percent of the volume class 6 old-growth in the project area would be harvested, which is intermediate among the action alternatives. Alternative 3 proposes to construct the highest road mileage of all the alternatives (0.93 mi/mi^2, including both development and temporary roads and excluding shoreline). For these reasons, it is believed to be the least effective alternative for maintaining productive deer populations on the peninsula. However, Alternative 3 harvests the least amount of high-value deer winter range in the Duncan Creek watershed. Alternative 3 is also believed to be the alternative least likely to maintain a viable marten population on the peninsula because harvest units are dispersed more widely throughout the study area than any of the other alternatives. Relatively heavy harvest within the Mitchell Creek drainage may reduce the effectiveness of this area to serve as a corridor for marten dispersal between the medium WRA and more northern areas of the peninsula. In general, Alternative 3 would be the least effective for protecting wildlife.

Alternative 4

Under Alternative 4, a road would be built to access harvest units in the currently undisturbed Skogs Creek drainage. No roads or harvest units would be located within the medium WRA, but some harvest would occur within each of the small WRAs. The subsistence alternative has a goal of protecting deer populations from habitat loss, but balances this goal with protection of traditional human subsistence and sport hunting areas. Therefore, it avoids harvesting units of high-value deer habitat near the Tonka LTF or in the Colorado Creek drainage. These areas also constitute "good" quality habitat for marten. Of all the action alternatives, it harvests the largest amount of high-value deer winter range within the Duncan Creek watershed. Over the project area, this alternative would harvest the least amount of Volume Class 6 old-growth (10 percent). Alternative 4 proposes to construct the second highest road mileage of all action alternatives (0.91 mi/mi^2, including both development and temporary roads and excluding shoreline). It does not propose extending the road south towards Colorado Creek from the Tonka LTF; this area is considered better deer winter range than much of the peninsula. Alternative 4 would protect more deer habitat in traditional hunting areas than Alternative 5, but might reduce chances of sustaining a healthy deer population that can support human harvest.

Alternative 4 increases access to subsistence resources by proposing a road into the Skogs Creek watershed and so might increase both human and wolf predation on deer within this watershed. Human use may increase in the future with increases in population and tourism in the area; new roads, unless blocked from public use, would increase hunting pressure on the deer subsistence resource. The relatively high road density would also make marten vulnerable to over-trapping. Relatively heavy harvest within the Mitchell Creek drainage

may reduce the effectiveness of this area to serve as a corridor for marten dispersal between the medium WRA and more northern areas of the peninsula. Overall, Alternative 4 would be preferable to Alternative 3, but less effective than alternatives 1, 2, and 5, for protecting wildlife in the project area.

Alternative 5

The goal of Alternative 5 was to provide for maximum protection of old-growth-dependent species, while still harvesting enough timber to meet the project's purpose and need. This alternative concentrated harvest units in areas that had already been fragmented by road construction and timber harvest and protected areas that are now disturbed. One of the priorities for this alternative was to provide for the potential designation of Habitat Conservation Areas, as was recommended by the Interagency Viable Populations Committee for the purposes of creating a reserve network across the entire Tongass National Forest. Design criteria of the HCA strategy were incorporated into the delineation of the Wildlife Retention Areas associated with this project. In addition to the medium and small WRAs, it is thought that the Skogs Creek drainage should remain roadless for the following reasons: (1) the construction of a road into the area would increase the likelihood of future timber harvest activities in the watershed and increase future fragmentation of this last large roadless area; (2) the watershed encompasses an area with high topographic diversity and includes a variety of elevations, aspects, and gradients within it, and therefore is likely to support a diversity of wildlife; and (3) the proposed road to access this drainage runs within 330 ft of a goshawk nesting site and the road can not be re-routed due to physical constraints of the landscape.

This alternative proposes the construction of the lowest road density of all action alternatives (0.83 mi/mi^2, including both development and temporary roads and excluding shoreline). It provides for the strategy of protecting small WRAs in each VCU and a medium WRA in the lower peninsula. The biodiversity alternative was formulated with the goal of protecting those species such as deer requiring large unfragmented blocks of old-growth forest in order to maintain productive wildlife populations. It differs from the subsistence alternative in that it does not give priority to preserving those areas within easy hunting access of humans. It therefore proposes clear-cutting in areas of better deer habitat in Volume Class 6 habitats north and west of the LTF and along the existing road south of the LTF, where it is believed deer are already more vulnerable to human hunting harvest and wolf predation due to the proximity of roads and shoreline access, and also sacrifices this area of "good" quality marten habitat. It proposes the least amount of timber harvesting in the upper Mitchell Creek drainage and therefore retains a better forest matrix for marten dispersal between the medium WRA and more northern areas of the peninsula. Overall, the amount of Volume Class 6 old-growth harvested under this alternative would be intermediate among the action alternatives (about 16 percent). Overall, this alternative is believed to provide the best opportunity for protecting wildlife on the peninsula.

Cumulative Effects

Cumulative effects result from summation of past, present, proposed, and foreseeable activities. These cumulative impacts to wildlife resources in the South Lindenberg project area are most apparent as loss of wildlife habitat, because direct observations of changes in animal populations are rarely measured. Although clearcut habitat has some utility for certain wildlife species, temperate old-growth forest is a unique, globally rare habitat preferred over other successional stages by a variety of wildlife, including MIS such as marten and Sitka black-tailed deer. Harvested areas in the project area are proposed to be managed on an approximately 100-year rotation. Because this amount of time is insufficient for stands to regain old-growth forest habitat characteristics, the capacity of the Lindenberg Peninsula and Kupreanof Island to support wildlife with old-growth requirements such as deer and marten would be permanently reduced. See the Biodiversity Section for an evaluation of the loss and fragmentation of forest in the area since the first harvest entry in

the 1930s. In the context of other local, district, and forest-wide changes in wildlife habitat, how these changes affect the viability of wildlife populations on the Tongass National Forest is not known.

TLMP data provide one mechanism by which to measure the effects of past activities on the project area. As part of the land management planning process, the Forest Service estimated habitat capability for MIS in Wildlife Analysis Area #5138 (USDA Forest Service, 1991d). As described previously, WAA #5138 includes the Lindenberg Peninsula and some additional area on Kupreanof Island. Habitat capability was modeled for TLMP using point-grid-based habitat data for a baseline year of 1954 and for 1990, while estimates for this EIS were made using polygon-based habitat data for a baseline year of 1995. Because these two methods do not produce equivalent estimates of habitat capability, assumptions have to be incorporated to permit an evaluation of the cumulative effects of harvest on habitat capability for MIS in the project area. The first assumption is that the differences in habitat capability estimated by polygon-based data are proportional to those estimated by point-grid data, while the second assumption is that there has been no change in habitat capability between 1990 and 1995. Thus, 1954 habitat capability of the project area can be back-calculated by assuming that the percentage change in habitat capability from 1954 to 1990 using point-grid-based data would also have occurred for estimates made using polygon-based data. For example, between 1954 and 1990, habitat capability for deer in WAA #5138 declined by 8 percent (using point-grid-based data); thus, the 1995 habitat capability of the project area (modeled to be 1,412 deer) would be 92 percent of the 1954 habitat capability using polygon-based data (estimated to be 1,535 deer).

Cumulative effects on habitat capability for MIS are summarized in Table 4-20, using the assumptions just described. There have been losses in habitat capability for MIS in the project area over the last 41 years. For most MIS, habitat capability following the South Lindenberg timber sale would be an additional 4 to 10 percent below 1995 baseline conditions, relative to the estimated 1954 capability.

Mitigative Measures and Monitoring

The following section discusses mitigation for wildlife species that are not special-status species, such as marten, Sitka black-tailed deer, black bear, cavity-nesting birds, great blue herons, red-tailed hawks, and sharp-shinned hawks. Mitigation measures for Alexander Archipelago wolf, Queen Charlotte goshawk, and marbled murrelets are discussed in Chapter 4–TES Species.

Mitigation Measures Considered and Adopted

This section lists all of the mitigation measures that have been incorporated into one or more action alternatives for the purpose of reducing project impacts on wildlife resources; it also includes those measures more specific to reducing impacts on TES species elaborated on in Chapter 4—TES species) because these measures will reduce impacts to other wildlife as well. In addition to the mitigation measures which are included in the action alternatives for this project, this section describes “appropriate mitigation measures not already included in the proposed action or alternatives” as directed by Council on Environmental Quality regulations (40 CFR Sec. 1502.14[f]). The reasons for the exclusion of these mitigation measures in the alternatives are discussed, and the potential benefits in reducing project impacts to wildlife that would possibly result from their implementation are explored.

The following mitigation measures **are included** in all action alternatives:

- provision for Wildlife Retention Areas in each VCU;
- 500-foot beach fringe buffer;
- 100-foot stream buffer for salmonid streams;

- closure of temporary roads by use of ditch barriers;
- precommercial thinning of most units;
- snag and green tree retention within 1/2 to 2/3 of harvest units;
- snag retention in all units;
- group selection harvest (helicopter logged);
- 300-foot windfirm buffers for confirmed active nests of great blue herons, sharp-shinned hawks, red-tailed hawks, and owls; and
- timing restrictions for mechanical disturbance within 1/8 mile of confirmed active nests of great blue herons, sharp-shinned hawks, red-tailed hawks and owls.

The following mitigation measure **is added** to the above for one or more action alternatives:

- retention of Skogs Creek watershed as roadless area (alternatives 2 and 5).

The following mitigation measures **are added** to the above for Alternative 5 (Biodiversity):

- compliance with ViPop recommendations for small and medium HCAs in Peninsula;
- minimizing construction of new roads;
- concentrating rather than dispersing harvest units; and
- avoidance of harvest in areas potentially affecting sensitive salmonid habitat.

The following mitigation measures **were not** included as part of any action alternative. Some of these mitigation measures may only be addressed at the Forest Plan level:

- abandonment and revegetation of roads;
- permanent or long-term protection of retention areas, reserves, or Habitat Conservation Areas (HCAs);
- timber harvest proportional to volume classes of timber as represented in the project area;
- restrictions on trapping of marten in reserve areas;
- restrictions on salvage logging and subsistence gathering in reserve or retention areas; and
- extended timber harvest rotations.

Mitigation to Reduce Impacts Resulting From Loss of Old-Growth Forest Habitat

As a mitigation measure to reduce impacts to old-growth dependent wildlife species, retention or reserve areas were delineated incorporating current scientific guidelines. The preferred approach was to concentrate timber harvest in areas where similar activities have already taken place and to protect habitat in blocks as large as is feasible in areas that have remained roadless and undisturbed.

Protection of larger areas is generally preferable in order to preserve the mosaic of habitats represented within these large areas. Watersheds are the logical choice for designation of these large areas. Current scientific understanding generally supports the idea that large reserves are better than smaller, blocks of habitat that are close together are better than those farther apart, blocks that are roadless or otherwise inaccessible to humans are better than roaded or accessible blocks (Diamond, 1975; Noss and Cooperrider, 1994), and larger reserves require less management to maintain existing species and communities (White, 1987). Protection of habitat on a watershed level ensures the maintenance of the natural distribution and juxtaposition of habitat types, minimizes habitat fragmentation, and provides habitat for species for which there are little or no available data. With consideration of these recommendations, the following are proposed as mitigative measures to offset the adverse effects of net loss of old-growth forest resulting from the South Lindenberg Sale.

Table 4-20

Cumulative Effects of Timber Harvest on MIS Species Carrying Capacity

	Original Condition	Pre-Project Condition		Post-Project Condition			Cumulative Effect
	1954 Estimated Habitat Capability[1]	1995 Habitat Capability		Greatest Effect of Alternatives on Habitat Capability[2]			Greatest Effect of Alternatives on Original Condition (1954)
MIS Species	*# Animals*	*# Animals*	*(% of 1954)*	*# Animals*	*(% of 1995)*	*Specific Alternative*	*% Change*
Sitka black-tailed deer	1,539	1,412	92	1,337	95	2G Alt. 3	-13
Alexander Archipelago wolf	4[3]	4[3]	100	4[3]	100	all	0
marten	96	88	92	82	93	2G Alt. 3	-15
black bear	106	105	99	101	96	2G Alts. 3,5	-5
river otter	44	41	93	39	95	all	-11
red squirrel	38,589	36,989	96	35,503	96	C Alt. 5	-8
bald eagle	62	57	92	57	100	all	-8
red-breasted sapsucker	5,310	5,039	95	4,649	92	Alt.3	-12
hairy woodpecker	614	489	80	430	88	Alt.3	-30
brown creeper	903	361	40	297	82	Alt.5	-67
blue grouse	unable to estimate	3,597	unable to estimate	3,336	unable to estimate	---	unable to estimate

[1]An estimate of the 1954 habitat capability of the South Lindenberg project area was made under an assumption that the percentage change in habitat capability from 1954 to 1990 (USDA Forest Service, 1991a) is equivalent to the percentage change in habitat capability from 1954 to 1995.
[2]Where Habitat Capability is dependent on successional stage, "2G" is the second growth stage and "C" is the clearcut stage.
[3]Based solely on deer habitat capability.

Provision for Wildlife Retention Areas

Figure 4-6 depicts "Wildlife Retention Areas" (WRAs) proposed to meet TLMP requirements for old-growth forest retention (USDA Forest Service, 1985–1986) and to be consistent with land management guidance provided by the V-Pop report (Suring et al., 1992a). Figure 4-6 also shows a Queen Charlotte goshawk "Post-Fledging Area" (PFA) delineated so as to comply with habitat management guidelines for northern goshawk

Figure 4-6. Proposed Wildlife Retention Areas and Queen Charlotte Goshawk Post-Fledging Area

LEGEND

Study Area Boundary
Existing Roads
Streams
Existing Managed Stands
Non-National Forest
Wildlife Retention Areas
Post-Fledging Area
Beach Fringe Buffer
Estuary Buffer
Stream Buffers

SCALE 1 : 82,000

0 1 2 3
Kilometers

0 1 2 3
Miles

(USDA Forest Service, 1992b; USDA Forest Service, 1994b). Table 4-21 lists relevant acreages as recommended by the guidelines and as represented by the WRAs and PFA as configured for the project. See the TES animal section of Chapter 4 for a thorough discussion of mitigation and delineated PFAs for Queen Charlotte goshawk.

There is also considerable area within the Tongass Timber Reform Act (TTRA) stream buffers and beach and estuary buffers that can be considered retention, since no harvest is permitted in these areas. In the South Lindenberg area, these areas total 2,903 acres (outside of proposed WRAs) and are also shown in Figure 4-6.

Adequacy of Proposed WRAs to Support Populations of Marten—Marten may be the species most impacted by forest fragmentation in the project area. Recommendations for Medium HCAs were intended to be sufficient to support small local sub-populations of marten "that may be prone to frequent, local extinctions" (Suring et al., 1992). Small HCAs were intended to provide habitat capable of supporting at least one female marten in winters of poor prey abundance. The small WRA in VCU 439 has a high likelihood of supporting martens because of its proximity to the Duncan–Salt Chuck Wilderness area. Under alternatives 2 and 5 the Skogs Creek watershed would also be likely to support breeding martens due to the size of area that would remain undisturbed and roadless. The medium WRA may have a lower probability of supporting martens due to marten vulnerability to trapping along the shoreline and the fact that martens dispersing to this area from the nearest large or medium reserve area (the Duncan–Salt Chuck Wilderness) would have to travel long distances across a highly fragmented landscape. Although the protected beach fringe may provide an adequate corridor for martens, vulnerability of marten to trapping along the shoreline may increase mortality of martens using such a travel route.

The adequacy of proposed WRAs for supporting populations of Alexander Archipelago wolf, Queen Charlotte goshawk, and marbled murrelets is discussed in Chapter 4—TES Species. Retention of old-growth forest in WRAs for the purpose of maintaining populations of species that require large home range areas (e.g., marten, wolf, and goshawk) is expected to adequately protect populations of other species with smaller home-range requirements such as cavity-nesting birds, sharp-shinned hawks, red-tailed hawks, great blue herons, and owls.

Protection of Skogs Creek Watershed—Under alternatives 2 and 5, Skogs Creek watershed would remain in an undisturbed and roadless condition for the life of the project. Maintaining the currently-unmanaged character of this watershed is likely to greatly reduce impacts of the project on wildlife species, especially those that may be negatively impacted by human access such as wolves, marten, and deer. Skogs Creek area was observed to have some of the highest levels of marbled murrelet breeding activity in the project area. Protection of the area would reduce impacts to marbled murrelets from edge effects due to forest fragmentation. Impacts to wolves would be reduced by protection of this watershed because the area would remain fairly inaccessible to humans. Benefits to wolves in the watershed would include: (1) buffering of deer populations from increased human hunting, (2) reduced hunting and trapping mortality of wolves, (3) maintenance of natural predator-prey dynamics, and (4) affording wolves a relatively inaccessible area in which to den. Because a goshawk nest that successfully fledged at least two young in 1994 is situated within the area, it is believed to also contain good foraging habitat for this species.

Long-Term Protection of Reserve Areas—Protection of WRAs and the Skogs Creek watershed would be effective for the life of the project only. Long-term protection of reserves is a land allocation decision that can only be made at the Forest Plan level. Unless long-term protection is bestowed upon these areas, mitigation measures for wildlife protection will be effective for a very short term period only. Maintenance of breeding individuals in the project area of such species as wolves and marten, may be impossible without provision for long-term protection of some undisturbed, unfragmented, and roadless areas. A strategy for a system of permanent Habitat Conservation Areas is being considered in the most recent revision of the Forest Plan.

Alternative Silviculture

Group selection cuts are proposed instead of clearcutting in nine units. All of these units will be logged by helicopter in 1 1/2- to 2-acre patches. This method will remove 15–20 percent of the acreage within a unit, with additional entries scheduled at approximately 30-year intervals. This mitigation measure will leave old-growth trees and associated biota within the stand and will reduce impacts to some old-growth dependent wildlife species. Impacts on marten should be reduced in comparison to clearcut areas, especially if some large woody debris is left to provide cover for marten and small mammals.

Table 4-21
Apportionment of Old-Growth Habitat to Areas Reserved for Wildlife in the South Lindenberg Analysis Area

				Size and Composition of Reserved Areas		
VCU	CFL on the Lindenberg Peninsula *Acres*	Retention Goal for Operable CFL *Acres*	Total Reserved Area	Area *Acres*	Volume Class 4-7 *Acres*	Old-Growth Volume 5-7 *Acres*
437	13,840	719	WRA437	1,668	1,089	707
439	7,727	273	WRA439	2,010	1,522	455
447	7,778	1,513[1]	WRA447	3,494	1,604	1,121
448	1,469	1,591[1]	(included in the MWRA)	---	---	---
			MWRA[2]	12,499	5,552	2,620
V-Pop criteria (Suring et al., 1992)			Small HCA	1,600	800	---
V-Pop criteria (Suring et al., 1992)			Medium HCA	≥10,000	≥5,000	≥2,500
			PFA447	1,607	---	244
Forest Service guidelines (USDA Forest Service 1992b)			Post-Fledging Area	600	600	---

[1] VCUs 447 and 448 both extend off the Lindenberg Peninsula to include other islands.
[2] Includes portions of VCUs 437, 447, and all of VCU 448

Snag and Green Tree Retention

Mitigation measures that preserve some trees within each clearcut are provided for in all alternatives. For units with multiple settings or helicopter yarding, the silvicultural prescriptions for the South Lindenberg project include leaving 0.5- to 1.0-acre patches or

stringers of live and/or dead trees in-between the landings. Overall, approximately three snags per harvested acre will be retained. Both hard and soft snags with a minimum dbh of at least 15 inches and height of 10 feet will be retained. In addition, management prescriptions for units require minimization of damage to submerchantable trees to provide additional structural diversity. This mitigation provides for maintenance of the "biological legacy" of a site by providing a continuity of conditions for smaller organisms such as insects and fungi (Franklin, 1989; Gillis, 1990). Reserve clumps also provide cover for species that otherwise would not venture far into clearcuts or other openings. The effectiveness of these mitigation measures will depend on how windfirm these patches will be in the future. This measure should reduce impacts to cavity-nesting birds. It may also slightly reduce impacts to species that require old-growth tree rootwads, down wood, or hollow logs for denning activities (black bear, wolves, marten).

Muskeg and forest in the Skogs Creek drainage

Precommercial Thinning

Precommercial thinning will be conducted approximately 15–20 years after harvest and will be dependent upon site, stocking, and possibly other resource needs. Due to budget constraints, high site units will receive priority for precommercial thinning. This mitigation measure is included in all action alternatives. It may slightly reduce project impacts on Sitka black-tailed deer by providing additional forage that may increase deer overwinter survival in some years. However, since deer appear to be limited by severe winters (and thus available high volume old-growth winter range), this mitigation measure may be ineffective at reducing project impacts that result in net loss of old-growth deer winter range.

Extended Timber Harvest Rotations

Length of harvest rotation is a decision made at the Forest Plan level, therefore, different rotation periods are not included as part of the mitigation measures included in the action alternatives. Recovery of clearcuts to stands with old-growth forest characteristics would require periods of at least 250 years in the project area. Impacts of the project on old-growth dependent wildlife would therefore not be reduced for an extremely long period. Longer

rotation periods would not be a reliable mitigation measure in itself because of the many uncertainties involved in such long-term planning. However, as long as provisions were made for permanent reserve areas in the project area, longer rotation periods would reduce impacts from harvest slightly over the very long term.

Timber Harvest in Proportion to Available Area of Each Volume Class in the Project Area

This mitigation measure was not included in the action alternatives because its value to wildlife would be questionable. High volume stands of Volume Class 6 forest make up only 4.8 percent of the commercial forest land in the project area. Harvest of this habitat type under all action alternatives is disproportionate to its representation in the project area; up to 17 percent of the timber harvest (under Alternative 2) would consist of these high volume stands. Harvest of timber volume classes in proportion to their availability in the project area would require cutting of more acreage of lower volume class timber if the same amount of timber volume is to be taken. This mitigation measure may not significantly reduce impacts of the project on wildlife because it would result in more road construction and forest fragmentation.

Mitigation to Reduce Impacts Resulting From Increases in Forest Fragmentation and Edge Effects

Species that are expected to be most negatively impacted by increased forest fragmentation and edge effects in the project area are marbled murrelets (see Chapter 4—TES Species for discussion pertaining to marbled murrelets), Sitka black-tailed deer, and marten. Mitigation measures that may reduce impacts resulting from forest fragmentation include: (1) provisions for wildlife corridors between remaining old-growth forest blocks, (2) preservation of large unfragmented old-growth areas, and (3) closure and restoration of roads to pre-project conditions.

Provisions for Wildlife Corridors

Wildlife corridors were considered in the selection and layout of units in the unit pool; however, these corridors have received no formal designation. All alternatives possess similar continuous parcels of forested habitat along the western portion of the Lindenberg Peninsula, including TLMP-mandated beach fringe and estuary habitat, that provide a WRA continuous link from the Medium WRA to WRA 439 and the Duncan Creek—Salt Chuck Wilderness Area. Through the middle of the peninsula, continuous forested habitat links the Medium WRA with WRA 437 and with WRA 447. However, Proposed Harvest Unit 55 (alternatives 2, 3, and 4) does sever the largest connection of forested habitat between WRA 437 and WRA 447, although other narrower connections of continuous forested habitat do link the two retention areas. Along the eastern shore of the Lindenberg Peninsula, TLMP-mandated beach fringe and estuary habitat provides a continuous forested connection from the Medium WRA to the State-owned lands; connection to the Mountain Point goshawk Post-Fledging Area will depend upon how these State lands are managed. There are also continuous forest linkages (for Action Alternatives 3, 4, and 5) that connect the Medium WRA with habitat north of Road 6350 near the LTF. Action Alternative 2 proposes clearcutting of proposed harvest units 109, 114-M, and 116-M, the combination of which would sever forested connections between habitat south of the main road with habitat north of the road. Connection between the area just north of the LTF with the Mountain Point goshawk PFA relies primarily, but not exclusively, upon contiguous forested connections that traverse the State-owned lands along Wrangell Narrows. Currently, the Forest Service is unable to manage for continuous connections between the upper reaches of the Skogs Creek watershed and habitat in the Duncan Creek watershed; continuous forested habitat, if present, exists only through State-owned lands. Thus, management for wildlife corridors along the

eastern portion of the South Lindenberg analysis area cannot be accomplished solely through efforts of the Forest Service.

Management recommendations for these corridors are the same as those recommended for reserves: (1) no harvest of old-growth timber would be permitted in designated corridors unless an alternate corridor is first designated, (2) harvest of second-growth timber may be permitted if new roads are not constructed and existing roads are closed to the public, (3) salvage harvesting would be permitted only in the case of catastrophic events larger than 100 acres, and (4) roads should be located outside of corridors unless no other reasonable and prudent route exists (Suring et al., 1992a).

The success of the strategy of maintaining viable wildlife populations through a system of small, medium, and large reserves will ultimately depend upon the maintenance and effectiveness of corridors between reserves. This is because the smaller reserves are not large enough to support sub-populations of species with large home range requirements within the area protected, without some exchange of individuals occurring between reserves. A conservative approach has been recommended as very little information on the use and effectiveness of corridors exists in the scientific literature. There exists no supporting evidence that rates of exchange between reserves can be predicted from dispersal distances exhibited by individuals of a species. Poorly dispersing wildlife species may not be adequately provided for, since distances between reserves are fairly large in some instances. One impact that could result from not providing for these species is local extinctions of prey species within smaller reserves, with resulting consequences to predator species. Smaller species dispersing through narrow corridors are likely to be more vulnerable to predation because the new territory would be unfamiliar to them and escape cover would be more limited in area. Individuals traveling in protected shoreline buffers may be vulnerable to trapping and hunting harvest.

Marten are likely to be the species most affected by inadequate corridors between Habitat Conservation Areas, designated wilderness, and/or old-growth forest retention areas. There are little or no data available on the use of corridors by marten. Marten are known to avoid crossing clearcuts (Bissonette et al., 1988; Clark et al., 1987; Kiester and Eckhardt, 1994), and appear to require the cover afforded by scattered trees or down wood when crossing large openings (Koehler and Hornocker, 1977). Narrow corridors of about 100 m in width may be adequate for short travel distances of a few hundred meters (Flynn, 1991); however, narrow corridors may be susceptible to windthrow and their effectiveness may thus be reduced over time. It is recommended that corridors of at least 600 feet in width be provided for general dispersal of marten across the landscape (Bissonette et al. 1988), preferably located in riparian corridors.

Protection of Stream Buffers and Beach Fringe

A minimum 100-foot buffer for all salmonid-bearing streams is included in all of the action alternatives for the South Lindenberg project. In addition, a 500-foot beach fringe area is to be protected under all alternatives. These measures will reduce impacts of fragmentation by providing old-growth corridors between remaining blocks of old-growth habitat. Their effectiveness at reducing these impacts will depend upon how they are affected by windthrow and whether wildlife using these corridors (especially the beach fringe) prove more vulnerable to human-caused mortality through hunting and trapping. These measures are expected to reduce project impacts to less than significant for bald eagle, since they nest along the shoreline, and for land otter, which tend to use forested habitat primarily along the shoreline and streams.

Mitigation to Reduce Impacts Resulting From Increased Road Density

Road construction for the purposes of timber harvest activities planned for the South Lindenberg project area will result in an increase in road densities to 1.09 to 1.17 mi/mi^2 (including shoreline access and excluding temporary roads). Much of the length of these roads exists at distances less than 2 mi from the beach. Most impacts predicted to result from increased road density are related to the higher levels of legal and illegal hunting and trapping of marten and Alexander Archipelago wolves that occurs along roads. It should be noted, however, that lack of a land connection of the South Lindenberg road system to other road systems on Kupreanoff Island currently limits the amount of traffic within the area. Consequently, impacts resulting from increased road density are likely to be less than the potential impacts identified from research in other areas, unless there is a substantial increase in traffic. Mitigation measures that could be used to reduce impacts of roads include barriers to public use and the obliteration of roads. The following sections discuss the potential effectiveness of mitigation measures to reduce impacts of roads on marten. Discussion of effective mitigation for Alexander Archipelago wolves is addressed in Chapter 4—TES Species.

Obliteration of Temporary Roads

About one-third of the total road mileage proposed for construction under all action alternatives will be designated as temporary roads (see Table 4-18). Temporary roads constructed for the project shall be obliterated after project completion. The effectiveness of obliteration at reducing public use of these roads will determine the intensity of impacts to wildlife that will occur along these road sections. No closures or barriers are planned for main development roads; impacts to wildlife resulting from increased access via development roads will not be mitigated.

This mitigation measure should significantly reduce impacts resulting from car and truck use in areas accessible by these roads. This measure alone, however, will not reduce these impacts to insignificant levels for species that may be negatively affected by increased road access (wolf, deer, and marten). The reasons for this are (1) all roads will remain the primary travel corridors for humans (and possibly wolves), even if only used on foot due to the difficulty of overland travel through the surrounding landscape, (2) it may be very difficult to effectively close roads to off-road vehicles, and (3) enforcement of road closures is unlikely to occur in the project area.

Obliteration of roads will not reduce impacts resulting from travel on foot or by off-road vehicle on the temporary roads in the project area. Obliteration of temporary roads may slightly reduce overall hunting and trapping impacts on deer and marten resulting from increased road access in the project area. However, it may only reduce those impacts generated by those hunting with cars and trucks and only along the temporary road corridors.

Forest Development Road Management

Under all the action alternatives, permanent roads, or Forest Development Roads (FDRs), would receive constant or intermittent use depending on the timing of harvest. After commercial use of these roads is complete, public use with highway vehicles would be discouraged, off-road vehicle use would be accepted, and hiking and bicycling would be encouraged. This would be accomplished by relying on advisory signs, by using trees and brush to camouflage the road entrance, by creating large ditches or “tank traps” at the entrance to the road, and by allowing alder to eventually close the road (10 to 15 years). Roads could be cleared and reopened in the future for resource management purposes.

When all temporary roads are effectively closed to public use, the majority of roads in the project area will continue to afford access to humans. No mitigation opportunities exist to

significantly reduce impacts on marten and deer resulting from increased road density other than to minimize the number of roads that are constructed or to obliterate some roads after timber harvest has taken place. Since cumulative impacts due to increased human access may result in more severe impacts on marten than habitat loss, obliteration of logging roads would be the most effective mitigation measure for reducing project impacts on this species.

Roads left intact can serve to access timber for future harvest activities and would therefore have to be rebuilt in the future if obliterated upon project completion. Roads may also be used for mining or other resource extraction purposes and are used by the public for hunting, subsistence gathering, and other recreational activities. However, if no timber harvest is projected until the next rotation, the benefits of leaving an extensive road system intact for 100 years or more should be weighed against the long-term cumulative impacts on wildlife that this road system may cause throughout this time period.

Hunting and Trapping Restrictions

Hunting and/or trapping restrictions were not included as mitigation for impacts to wildlife species under any of the action alternatives. However, these are tools which may need to be used at times if habitat loss and fragmentation, increased human access, severe weather, or other factors result in reduced numbers of wildlife species. The increase in road density and the loss of high volume old-growth forest may result in declines of certain species that have legal hunting or trapping seasons such as wolves, marten, and Sitka black-tailed deer. Permanent or temporary restrictions on hunting and/or trapping within reserve or retention areas could function as mitigation for impacts resulting from the project and may insure that these species continue to exist within the project area.

Closure of areas to marten trapping would be very difficult to enforce, especially if marten are being trapped off of the main road corridors. Due to the small size of the animal involved, hiding the evidence of illegal trapping would be relatively easy in comparison to poaching of big game. Despite the difficulties of enforcement, the closure of reserves to consumptive uses such as trapping may become necessary at times as a mitigation measure to insure the persistence of marten reproduction in these areas and to help insure that enough excess individuals are produced to support trapping in other areas of the peninsula. Marten harvest data for WAA 5138 will be monitored on a continuing basis before and after management activities in order to attempt to track population responses that may result from project impacts.

Mitigation to Reduce Impacts on Nesting Birds

To prevent mortality of bird eggs and young, destruction of active nests, and loss of reproductive effort by adult birds, and to allow adult birds sufficient time to relocate and renest within the same season, roads should be constructed and timber harvested as early as possible in the spring before the nesting season has advanced to any great degree. Road construction and timber harvest taking place during the nesting season will likely result in destruction of nests and mortality of young of various bird species and will not be mitigatable. Mitigation measures to prevent project impacts on confirmed active nests of Queen Charlotte goshawk, red-tailed hawk, sharp-shinned hawk, marbled murrelets, great blue heron, and owls are included under all action alternatives.

Mitigation for Great Blue Heron, Sharp-shinned Hawks, Red-Tailed Hawks, and Owls

Active nests of great blue herons, sharp-shinned hawks, red-tailed hawks, and owls will be protected under all action alternatives by a 300-foot windfirm buffer surrounding the nest site where no timber harvest or road construction will occur. During the nesting season,

from 1 March to 15 August, mechanical disturbances of greater than three days will be restricted within 1/8 mile radius of nests unless the nest becomes inactive or unsuccessful.

Monitoring Plans

Marten

Marten harvest data for Wildlife Analysis Area 5138 will be monitored on a continuing basis before and after management activities in order to attempt to track population responses resulting from project impacts.

Great Blue Heron, Sharp-Shinned Hawk, and Red-Tailed Hawk, and Owls

For active nests of great blue heron, sharp-shinned hawk, red-tailed hawk, and any other raptor (including owls) found within harvest units, mitigation measures as outlined in the preceding section on Mitigation will apply: Nests shall be monitored annually for not less than two years following their discovery. If the nest site remains inactive for two consecutive years, protection measures for the nest site may be removed.

Two great blue heron nests were found in the 1994 season in or near units 4 and 6. Each of these nests will be monitored annually for not less than two years after being found to be active.

One red-tailed hawk nest was found in Unit 43. This nest will be monitored annually to determine if it is still active prior to harvest.

Units in which territorial behavior (indicating proximity of the observers to a nest area) of sharp-shinned hawks (units 6, 16, 21, 28, 67, 90, 98, 114, 19, and 146) or red-tailed hawks (units 6, 42, 90, 97, 107, and 124) was observed during the 1994 field season will be surveyed prior to harvest in order to attempt to locate nest sites within the harvest unit. If nests are found to be present within harvest units, mitigation measures to protect the nest site will be implemented.

Fish

Road construction and timber harvest can result in impacts to fish resources. Roads can contribute sediment to streams, both through erosion of the road surface and through mass wasting of cut and fill slopes in higher gradient areas. Increased sediment loads can reduce the suitability of spawning areas, reduce the number and depth of pools, and reduce prey populations. Roads also increase public access to fishing areas, which may result in higher harvest of fish by anglers. Where there are no buffers, clearcut logging can directly impact streams by decreasing stream shading which can result in increased water temperature or by reducing the number or size of trees that can be recruited into the stream as large woody debris (LWD). LWD provides cover for fish, retains sediment, and tends to produce pool habitats. Removal of streamside trees can also reduce bank stability, thereby increasing bank erosion and channel migration. Indirect impacts of even-aged stand management involve changes in soil stability and hydrology prior to the "greening-up" of the new forest stands. Tree harvest can reduce soil stability, leading to mass wasting events that deposit sediment in streams. Changes in rain water interception, plant transpiration, and snow accumulation can alter the timing and magnitude of peak or base flow runoff in harvested areas. Hydrological impacts related to harvest are discussed in the watershed section of this chapter. The remaining impact types are discussed individually below, as are the relative risks of these impacts occurring by the different action alternatives.

Temperature Impacts

All Class I and Class II streams that flow directly into Class I streams have at least 100 ft buffers adjacent to harvest units, consequently no additional thermal increases are expected at these locations. However, buffer strips are not mandatory for all Class III streams, but can be established if resource conditions warrant. Class III streams do not contain fish, so no direct impacts to fish would occur in these areas, but harvest along Class III streams would remove shade producing trees which could result in possible water temperature increases. Solar heating of rainwater can also occur in clearcuts prior to accumulation into active, defined stream channels. These increases in water temperature are transported downhill, mixed within the stream network, and further modified (both cooling and warming) by downstream thermal processes, such as shading, heat transfer, and back radiation. Consequently, actions occurring upstream in harvested areas could affect fish-bearing waters downstream of the affected Class III streams. Table 4-22 presents the number of miles of Class III stream within harvest units. Alternative 3 has the highest number of Class III stream miles in harvest units, while Alternative 2 has the least. Consequently, Alternative 3 would likely have the highest relative thermal impact of the four action alternatives. Any temperature increases within harvested areas represent a short-term impact that would be eliminated in 4-5 years as new vegetation grows and provides shade to streams within harvest units. Only Mitchell Creek was identified during field studies to be approaching upper water temperature standards. If temperature increases in harvested areas did affect the temperatures within the lower reaches of Mitchell Creek, adverse impacts could occur. Existing evidence suggest that water temperatures in Mitchell Creek can exceed preferred levels of less than 58.2°F for salmonids (Reiser and Bjornn, 1979) during extended periods of low flow and sunny weather lasting more than a week. Moderate temperature increases above the preferred range can lead to sub-lethal impacts such as inhibition of feeding and reduced growth rates. Extreme temperature increases to more than 77°F, although unlikely to occur, could lead to mortality and reduced numbers of coho salmon, steelhead trout, and resident trouts. Only small differences in the number of miles on Class III streams within harvest units are present among the alternatives for Mitchell Creek. Alternatives 2, 3, and 5 have 3.9 miles of Class III streams in proposed harvest units and Alternative 4 has 4.4 miles. Alternative 1 proposes no harvest and would have no effect on water temperatures.

Sediment Impacts

Streamside harvest and road construction could both result in short- and long-term increased sediment levels within streams. Sediment impacts of streamside harvest involve increased bank erosion from vegetation removal and yarding activities and the lack of an undisturbed vegetated buffer to filter sediment from upland areas. Some short-term sediment increases can be expected from each of the action alternatives but should be minimized with implementation of best management practices. On a relative basis, Alternative 2 is expected to have the greatest impact while Alternative 5 is expected to have the least, with alternatives 3 and 4 intermediate. Although Alternative 2 has the fewest number of miles of Class III stream within unit boundaries (Table 4-22), only 9.2 percent of the proposed harvest acreage is by helicopter yarding which provides the greatest protection by eliminating cross-stream yarding. In contrast, helicopters are the proposed yarding method for 24.7 to 28.3 percent of the cut acres in alternatives 3, 4, and 5. Alternative 1 would have no additional affect on instream sediment levels compared to present conditions. Field visits suggested that the presence of beaver ponds downslope of harvest areas along the mainstem Duncan Creek may mitigate sediment impacts from harvest in these areas. Beaver ponds act as semi-permanent sediment sinks, which can delay or reduce sediment transport downstream. However, negative impacts can be severe when beaver dams are breached, releasing the stored sediments.

Roads contribute sediments to streams in three ways. First, rainfall on roads is concentrated and directed off the road surface using ditches and culverts. Depending on the amount of exposed soil, total water volume, etc., this runoff can carry fine sediment to fish-bearing

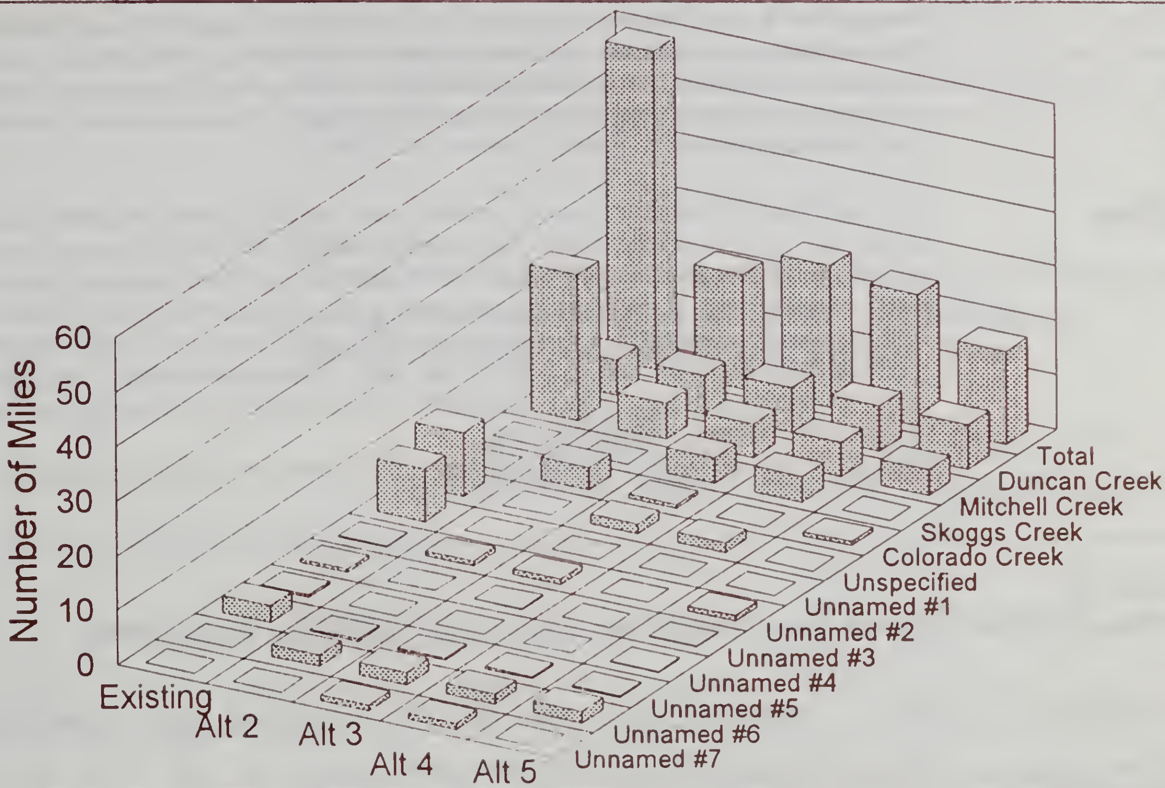
streams. Secondly, mass wasting of sediments from cut and fill slopes can deliver large quantities of coarse and fine sediment to nearby streams. Finally, stream bank erosion processes and scour can increase sediment loads from improperly engineered stream crossings. Sediment from roads can be short- or long-term impacts (Furniss et al., 1991). Short-term impacts are incurred during construction of both temporary and developed roads, while long-term impacts are incurred throughout the life of a developed road. Long-term impacts from temporary roads are avoided by decommissioning and revegetating road corridors. Alternative 3 has the greatest amount of new temporary and developed road building (Table 4-23 and Figure 4-7) and the highest number of streams to be crossed. Consequently, it has the greatest likelihood of short-term impacts. When added to the existing road network, Alternative 3 would also have the greatest total permanent road mileage, and therefore long-term sediment inputs from road related erosion are also expected to be greatest under this alternative. Alternative 5 proposes the fewest new developed road miles and has a correspondingly smaller potential for long-term sediment problems. Short-term sediment impacts are expected to be lowest and similar between alternatives 2 and 5. While Alternative 5 has more culverts to be placed on Class III streams, in comparison to Alternative 2 it has fewer culverts on Class II streams and one less bridge to be built over a Class I stream. Alternative 1 involves no new road construction and no additional road use for harvest activities and would not result in additional road related sediment inputs. Additional discussion of road related sediment impacts is presented in the watershed and roads sections.

Table 4-22

Number of Miles of Class III Streams Within Harvest Units by Alternative and Watershed

Watershed Name	Alt 2	Alt 3	Alt 4	Alt 5	Total Stream Length
Duncan Creek	4.3	7.3	7.4	7.4	66.9
Mitchell Creek	3.9	3.9	4.4	3.9	48.2
Colorado Creek	1.7	0.6	0.0	0.9	14.9
Skogs Creek	0.0	1.4	1.4	0.0	19.1
Unnamed #1	0.5	0.5	0.5	0.5	16.3
Unnamed #2	0.6	1.9	0.0	2.0	6.7
Unnamed #3	0.2	0.1	0.0	0.1	2.6
Unnamed #4	0.0	0.0	0.0	0.0	1.1
Unnamed #5	0.8	0.1	0.4	0.3	3.4
Unnamed #6	0.9	0.7	0.0	0.9	2.8
Total	12.8	16.4	14.1	15.9	182.0

Figure 4-7
New and Existing Roads on the Lindenberg Peninsula for each of the Action Alternatives



Fish Passage

Roads could impact fish populations by blocking fish passage at stream crossings, a short-term impact for temporary roads and long-term impact for permanent roads. The objective for Class I and II streams is to maintain the natural migration of adult and juvenile anadromous and resident fish populations where economically feasible (USDA Forest Service, 1986). Culverts are typically used for road crossings of smaller streams, whereas bridges are used for larger streams and rivers. Bridges will be considered for stream crossings when acceptable fish passage can not be maintained by culverts. If culverts are not properly designed and maintained they can clog with debris, become "perched" (i.e., elevated above the downstream water surface), or funnel stream flow causing high water velocities. These conditions can limit or prevent fish movement through the stream crossing structure by exceeding swimming or leaping capacities of adult or juvenile fish.

No culverts are proposed for Class I streams by any alternative (Table 4-24); consequently no fish passage impacts to anadromous fish are expected. However, several large culverts are proposed on Class II streams. Both alternatives 3 and 4 have twenty proposed large culverts on Class II streams and have the highest potential for future passage problems to resident fish. In contrast, alternatives 2 and 5 propose four and three large culverts, respectively, and are expected to have the lowest potential for future resident fish passage problems. Alternative 1 involves no new road construction and would not result in any additional fish related passage barriers over the current conditions.

Fishing Access

New roads could also impact fish populations within the Lindenberg Peninsula by increasing public access to fishing areas, a long-term impact. Increased access could lead to increased angling pressure, which could alter the size structure or population density of resident fish or the number of spawning individuals of anadromous fish species. Currently only the Mitchell Creek drainage, a small portion of the Duncan Creek drainage, and the small unnamed

drainages south of the Tonka log transfer facility are accessible by vehicles ferried to the peninsula. New roads in all action alternatives could increase sport fishing opportunities.

Alternative 3 would provide the highest level of increased access from new permanent roads, while Alternative 5 would provide the lowest. Alternatives 2 and 4 would allow for an intermediate level of increased access. All of the action alternatives would increase access to Duncan Creek. Accessibility to Colorado Creek would increase substantially from Alternative 2, slightly from alternatives 3 and 5, and none from Alternative 4. In contrast, accessibility to Skogs Creek would increase substantially from alternatives 3 and 4, but not at all from alternatives 2 and 5.

Cumulative Effects

Existing timber harvest and roads are present in the Mitchell Creek, Duncan Creek, and Unnamed Creek 1 watersheds, plus four of the six smaller unnamed watersheds on the eastern side of the peninsula. Alternatives that affect larger watershed areas have a greater potential to impact fish. In the same way, past or future timber harvest activities, combined with the current proposed sale, have a greater effect on fish resources than would be expected from any of the current alternatives alone. This combination, or cumulative, effect is largely restricted to areas within watersheds, because fish in one drainage are usually not impacted by changes in other drainages.
Cumulative effects can be difficult to observe, particularly on large watersheds (Chamberlin et al.,1991). The degree of the effect is dependant upon the frequency and magnitude of individual impacts plus the rate of recovery by the watershed. Some of the specific factors that could influence cumulative effects to fisheries are the size of harvest and its physical relationship to streams; the length of road present, its characteristics, and the number of streams crossed; the effectiveness of best management practices implemented; and basin hydrology and fluvial geomorphology. Few of these factors have been studied in combination with sufficient detail to provide a comprehensive model for predicting the added cumulative effects of new managed stands in a watershed. However, the number of existing and proposed new harvested acres and road miles have been examined to help evaluate the relative risk of cumulative effects by the different alternatives to watersheds already containing managed stands.

Table 4-23
Miles of Existing and New Roads for Each Alternative by Watershed

		Alt 2			Alt 3			Alt 4			Alt 5		
Watershed Name	Existing	Temp.	Dev.	Total	Temp.	Dev.	Total	Temp.	Dev.	Total	Temp.	Dev.	Total
Colorado Creek	0.0	0.7	3.3	4.0	0.3	0.4	0.7	0.0	0.0	0.0	0.3	0.4	0.7
Duncan Creek	6.4	1.0	6.0	7.0	0.9	7.3	8.2	1.0	7.3	8.3	1.0	7.3	8.3
Mitchell Creek	26.7	3.4	3.2	6.6	3.3	2.9	6.2	3.4	2.8	6.3	2.9	1.7	4.6
Skogs Creek	0.0	0.0	0.0	0.0	0.9	3.7	4.6	0.9	3.7	4.6	0.0	0.0	0.0
Unnamed#1	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed#2	0.2	0.0	0.9	0.9	0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.9	0.9
Unnamed#3	0.6	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
Unnamed#4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Unnamed#5	3.0	0.0	0.3	0.3	0.0	0.3	0.3	0.0	0.3	0.3	0.0	0.3	0.3
Unnamed#6	0.0	0.3	1.7	2.0	0.3	2.0	2.3	0.0	1.7	1.7	0.3	1.7	2.0
Unnamed#7	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0
Unspecified	11.7	0.0	0.0	0.0	0.0	1.7	1.7	0.0	1.7	1.7	0.0	0.0	0.0
Total[1]	58.7	5.5	15.3	20.8	5.8	20.2	26.0	5.5	18.6	24.0	4.7	12.3	17.0

[1]Totals differ slightly from Tables 2-9 and 4-41 due to rounding errors.
Temp. = Temporary Roads
Dev. = Developed Roads

Duncan Creek currently has 3.3 percent of its acreage under management from harvest during 1990, which regulated 6.4 miles of permanent roadway (Tables 4-23 and 4-25). An additional 4.6 (Alternative 2) to 6.8 (Alternative 4) percent of its acreage are proposed for harvest which would require 6.0 (Alternative 2) to 7.3 (alternatives 3, 4, and 5) miles of new permanent roadway. On a relative basis, it is expected that Alternative 2 will have the lowest level of cumulative effects due to its lower addition of roads and harvest acreage plus its lower utilization of units in sub-basins that are already under management. Alternative 4 would be expected to incur the highest level of cumulative effects because it utilizes all new harvest units currently proposed for the watershed.

Table 4-24

Number of Culverts Greater than or Equal to 48 Inches in Diameter and Bridges at Stream Crossings by Roads for each Alternative and Stream Class

	Class III		Class II			Class I
	Permanent	Temporary	Permanent			Permanent
	Culverts	Bridge	Culverts	Bridges	Bridges	Bridges
Alternative 2	44	2	4	1	2	1
Alternative 3	73	2	20	1	5	2
Alternative 4	62	2	20	1	5	2
Alternative 5	53	2	3	1	1	1

Unnamed Creek 1 Watershed currently has 11.7 percent of its acreage under management and 9.6 miles of permanent road (Tables 4-23 and 4-25). Cumulative effects within this watershed are expected to be minimal because there is only one unit representing 0.6 percent of the watershed area under all alternatives. No new roads will be required to harvest this unit.

Mitchell Creek has 10.8 percent of its drainage area under management that began with harvests in 1982 and continued intermittently through 1993 (Table 4-25). An additional 4.0 (Alternative 5) to 5.2 (Alternative 4) percent of its area is proposed for new harvest which will require 1.7 (Alternative 5) to 3.2 (Alternative 2) miles of new permanent roadway (Table 4-23). Although the range of harvest levels is relatively narrow, it is expected that Alternative 5 will add the least amount of cumulative effects to the watershed due to its combination of lower additional harvest acreage and road miles plus utilization of helicopter yarding in some areas. Alternative 2 is expected to have a higher cumulative effect because of the added road mileage and its utilization of units prescribed predominantly for even-aged management and cable yarding.

Unnamed Creek 3 Watershed currently has 6.3 percent of its acreage under management from entries that occurred during 1981 and includes 0.6 miles of road (Tables 4-23 and 4-25). An additional 0.0 (Alternative 4) to 5.1 (Alternative 2) percent of the watershed is proposed for future harvest without substantial new roads required. It is expected that only Alternative 2 will include any appreciable cumulative effects, because of its higher proposed acreage in the watershed and its utilization of units relying on cable yarding methods. Alternatives 3 and 5 propose an additional harvest of only 1.4 percent of the watershed acreage, most of which would be yarded by helicopter.

Unnamed Creek 5 Watershed currently has 20.1 percent of its acreage under management from entries that occurred between 1980 to 1982 (Table 4-25). Consequently, only long-term impacts, primarily from the three miles of permanent road, are still being expressed in

the watershed. New harvests are proposed on 2.1 (Alternative 3) to 5.4 (Alternative 2) percent of the watershed's drainage area and a total of 0.3 miles of new road is proposed by all action alternatives (Table 4-23). Alternative 2 is expected to have the highest level of cumulative effects due to its higher acreage and its higher utilization of units relying on cable yarding methods. In contrast, Alternative 3 is expected to have the lowest level of cumulative effects due to its lower acreage and exclusive use of units yarded by helicopter.

The remaining two watersheds with managed stands, Unnamed Creek 2 and Unnamed Creek 4, are not expected to have appreciable cumulative effects because previous harvest has occurred over only 1.6 percent and 0.7 percent of their drainage areas, respectively (Table-4-25). Neither is expected to have new harvest over more than 3.8 percent of their areas under the present alternatives or require substantial new roads (Table 4-23).

Table 4-25

Existing and Proposed Harvest (as a Percent of Drainage Area) for Watersheds within the South Lindenberg Assessment Area Currently Under Management

Watershed	Existing Harvest (%)	Proposed Harvest (%) Alt 2	Alt 3	Alt 4	Alt 5
Duncan Creek	3.3	4.6	5.9	6.8	6.3
Unnamed Creek 1	11.7	0.6	0.6	0.6	0.6
Mitchell Creek	10.8	4.9	4.2	5.2	4.0
Unnamed Creek 2	1.6	3.8	2.4	0.0	3.5
Unnamed Creek 3	6.3	5.1	1.4	0.0	1.4
Unnamed Creek 4	0.7	0.9	0.1	0.0	0.8
Unnamed Creek 5	20.1	5.4	2.1	5.2	5.1

Significant peak flow increases may occur when harvest exceeds 20 percent of a basin acreage (Harr, 1980). Only Unnamed Creek 5 watershed reaches or approaches this threshold. Other cumulative effects to stream channels are discussed in the Watershed Section of Chapter 4.

Nearshore Marine Impacts

Impacts to nearby marine and estuarine environments were raised as concerns during the scoping process. The major concerns were to shrimp and crab production in the Duncan Canal region. Possible impacts include increased water temperatures and increased sedimentation in important reproductive and larval rearing areas. Marine waters in the area are cold and tidal currents are strong, which contribute to high levels of mixing and help to mitigate temperature increases and to disperse the settling of suspended sediments.

Only the Mitchell Creek drainage was identified as having possible temperature sensitivity during low flow and warm weather conditions. As stated previously, the action alternatives do not have substantial differences in the number of miles of unbuffered Class III streams, which might affect stream warming. Sediment production rates to Duncan Canal from the project area are highly dependent upon stream morphology and flow. However, the total additional production of sediment is related to the number of harvested acres and miles of road built in a watershed. Based on these two factors from the Duncan Creek and Mitchell Creek Watersheds, Alternative 4 is expected to have the greatest impact on sediment levels in Duncan Canal, while alternatives 2, 3, and 5 are expected to have similar impacts. Alternative 1, the no-action alternative, proposes no additional harvesting or road building and consequently would have no new impacts to the nearshore marine environment.

Mitigative Measures and Monitoring

One approach to lessen many of the potential impacts discussed above is to prohibit timber harvest from areas immediately adjacent to streams, ponds and lakes. By preserving streamside trees, these buffer strips greatly reduce the potential for elevated water temperatures, LWD depletion, or increased bank instability due to harvest. Buffer strips can also reduce sediment inputs by acting as filters or barriers to sediment from adjacent areas.

Buffer Strips

The Tongass Timber Reform Act (TTRA) mandates the use of minimum 100-foot wide buffer strips along both sides of all Class I and Class II streams that flow directly into Class I streams. All Class I and II streams and their associated buffers are outside harvest units planned for the South Lindenberg area. Class III streams do occur in harvest units and would not normally be mitigated with buffer strips. However, specific circumstances such as unstable stream banks could lead to a buffer strip prescription for added protection of the stream. Where possible, setting boundaries within harvest units have been designed to minimize bank disturbance and in-channel activity on Class III streams not protected by buffer strips.

Wind may negatively affect fish habitat when large numbers of trees are blown in to streams blocking fish passage, removing streamside shade, or disturbing streambanks and increasing sediment. However, natural blowdown is also one of the principal mechanisms for introducing LWD into stream channels. Large woody debris is an important component to high quality fish habitat which functions to decrease water velocity, filters sediment, creates pool habitats, and provides cover from predators. Streams in the Lindenberg Peninsula with heavy concentrations of large debris are often excellent producers of coho salmon. Consequently, limited areas of blowdown, which are inevitable, are not expected to compromise the quality of fish habitat in the South Lindenberg area. Risk of large scale blowdown that could negatively affect fish is reduced or eliminated by avoiding harvest near fish-bearing waters or by increasing buffer strip widths beyond minimum requirements in suspect areas.

TTRA stream buffers protect riparian corridors

Temperature

Buffers provided along Class I and II streams, and prescriptions for the retention of understory riparian vegetation near Class III channels are expected to prevent substantial temperature increases. These prescriptions include split yarding and tree felling away from streams.

Sediment

Sediment impacts from bank erosion are mitigated by reducing bank disturbances and preserving riparian vegetation. Buffer strips are effective in reducing or eliminating changes in bank erosion potential. In unbuffered areas, split yarding techniques, felling of trees away from streams, retention of large, and removal of small, woody debris from channels, and stabilization of disturbed areas following harvest can all reduce, but not eliminate, bank related sediment inputs.

Mitigation of road related sediment requires proper road design. Best management practices (BMPs) for roads require erosion control features such as water bars and sediment retention structures (USDA Forest Service, 1991c; 1993a). Use of these BMPs should reduce most short-term road construction related sediment inputs to streams in the South Lindenberg area. Long-term road-related sediment impacts are mitigated by road closures following harvest, including the removal of culverts and revegetation of road corridors. Road maintenance and monitoring is especially important to ensure that culverts are clear of debris and can easily pass peak flow events. Additional discussion of this impact is provided in the watershed and roads sections.

Timber harvest and road construction restriction periods will be observed to protect fishery resources. These restrictions ensure that streams are undisturbed during critical life history stages, including migration, spawning, and egg incubation. Guidance provided by ADF&G indicates that restrictions (no operations) on road construction in Class I, or Class II and III streams in close proximity to Class I streams, should occur during the period August 1 - June 15 in coho salmon areas, July 15 - May 15 where pink and chum salmon occur, and March 1-July 18 in steelhead areas (Cornelius, 1993). Nearly all of the streams in the South Lindenberg area have overlapping time restrictions. Consequently a compromise has been developed which only permits road-building activities in the period May 15 to August 15 for areas needing time restrictions. Pink and chum salmon spawn primarily in estuaries and the lowest portions of rivers. None of the action alternatives propose road crossings in these types of stream areas.

Fish Passage

Fish passage problems can be mitigated through the use of properly designed culverts and bridges. The Forest Service have developed several documents to provide guidance on BMPs to avoid passage problems. Both the Soil and Water Conservation Handbook (USDA Forest Service; 1993a) and the Aquatic Habitat Management Handbook (USDA Forest Service, 1986) provide specific direction on culvert construction, placement, and erosion reduction at crossings. If culverts and bridges are constructed according to these BMPs, then fish passage at stream crossings should not be impaired.

Fishing Access

Mitigation of increased public fishing access can be accomplished by closing roads to vehicular traffic after timber harvest is completed. Alternatively, the potential for over-harvest can be reduced through the use of fishing regulations that limit take, legal fishing gear, seasons, etc. Although fishing pressure is likely to increase in areas of new road construction, the relative remoteness of the Lindenberg Peninsula, even with increased road access, makes it unlikely that over-harvest would occur. Consequently, mitigation of public

access is not recommended unless monitoring efforts suggest deleterious effects of angling on fish populations.

Monitoring

Monitoring is required to ensure that BMPs to protect beneficial uses are both implemented and effective (USDA Forest Service, 1993a). Propagation of anadromous and resident fish is a major beneficial use of streams and rivers in the South Lindenberg area. Relevant BMPs to protect this beneficial use include: establishment of buffer strips, stabilization of disturbed streambanks, use of properly designed bridges and culverts, timing restrictions for construction and harvest activities, installation and maintenance of erosion control structures, control of road drainage, and road surfacing to reduce erosion. Monitoring to ensure implementation would involve site visits by Forest Service employees or their representatives to timber harvest or road construction sites during timber sale activities. Additional visits after harvest activities are completed may also be required if the BMPs require post-harvest activity (e.g., maintenance of structures).

If monitoring indicates that BMPs are not preventing degradation of water quality and fish habitat, then additional corrective actions should be identified and implemented. Monitoring results should identify relevant BMPs, indicate whether they have been implemented, and specify their effectiveness in protecting water quality and fish. If additional corrective actions have been implemented, they should be identified and their effectiveness assessed.

Enhancement

The primary fisheries enhancement opportunity in the South Lindenberg area is the installation of fish passage facilities where migration barriers currently exist and the seeding of newly-accessible habitats. The migration barrier near Unit 150 prevents use of a large quantity of good to very good spawning and rearing habitat present on Duncan Creek. Construction of a passage facility is under consideration for this barrier. Fish passage on a Mitchell Creek barrier has recently been achieved. Seeding of upstream habitats and continued monitoring of stock building success are important additional enhancement opportunities.

Threatened, Endangered, and Sensitive Species of Animals

As addressed previously in the Wildlife section of Chapter 4, timber harvest activities would alter existing wildlife resources through the loss and fragmentation of old-growth forest habitat and the building of roads to access harvestable timber. Impacts and mitigation particular to TES animal species (including species of concern such as former C2 species) detailed here.

General Impacts to TES Animal Resources

With the exception of the Alexander Archipelago wolf, Queen Charlotte goshawk, and marbled murrelet, TES animal species are not expected to be adversely affected by proposed management actions, although a few other TES species will be discussed briefly. Impacts are expected to occur in three areas: loss of old-growth forest habitat, increases in forest edge habitat, and increases in road density. For a discussion of current listing status of TES species (including species of concern) see section on TES species in Chapter 3.

Loss of Old-Growth Forest Habitat

Harvested areas in the project area are proposed to be managed on an approximately 100-year rotation. Because this amount of time is less than half the time required for stands to regain some old-growth forest habitat characteristics, the capacity of the Lindenberg Peninsula and Kupreanof Island to support old-growth dependent wildlife such as goshawk and marbled murrelets would be permanently reduced. Species with large home range requirements will have populations limited by the size of remaining forest habitat areas if the

species is primarily dependent on old-growth forest habitat. In the South Lindenberg project area, species with large home range requirements and dependency upon old-growth habitat include the Queen Charlotte goshawk. The Alexander Archipelago wolf also has large home range requirements, but is not dependent upon old-growth forest, while marbled murrelet is a TES species dependent upon old-growth but lacking a requirement for a large home range.

Impacts Resulting from Increased Habitat Edge

Timber harvesting and road construction result in the formation of edge habitat. Within Southeast Alaska, marbled murrelets are a species susceptible to population reductions resulting from increases in edge habitat. Marbled murrelets have a very low reproductive rate that may be related to a high rate of nest predation (Ralph, 1994). Egg and nestling periods each last approximately 30 days, resulting in a long period of vulnerability to nest predation. Corvids (in particular, Steller's jays and common ravens) are the most often cited predators of marbled murrelet eggs and nestlings (Nelson and Hamer, 1995; Singer et al., 1991). Populations of corvids are increasing throughout the western United States, and corvid predation on small bird nests has been found to increase with increasing forest fragmentation and proximity of nests to a forest edge.

Marbled murrelets in the project area might experience reduced reproductive success because of increased nest predation in old-growth forest habitat adjacent to clearcuts and road corridors. If effects of predation are severe, breeding populations in more fragmented nesting areas in the project area might become "sink" populations that can only be sustained by surplus individuals immigrating from "source" populations in less-fragmented old-growth blocks. Due to the low reproductive success evident throughout the species' distribution, there might be insufficient surplus birds to maintain sink populations in fragmented landscapes. Population responses of marbled murrelets might be difficult to monitor due to the expected long life span of the bird; declines might not be evident for several years after declines in reproduction.

Impacts Due to Roads

Road construction would result in three types of potential impacts to TES animal species: (1) increases in forest edge, as discussed above, (2) disturbance from road construction and logging traffic, and (3) increases in overall road density and human access.

Mechanical disturbance from road construction would primarily affect the Queen Charlotte goshawk. A new road into the currently undisturbed Skogs Creek drainage would be constructed under alternatives 3 and 4 that would be located within 330 ft of a known nesting site. Alternatives 2, 3, and 4 propose the construction of a new road within about 0.6 miles of the Mitchell Creek nest site. Under all action alternatives, road segments 43500, 43503, and 43504 would be constructed at a distance of about 0.65 miles from the Duncan Creek nest site. Road construction and logging that occurs within the breeding season may result in disturbance to nesting goshawks and could possibly result in nest abandonment.

Increases in the overall road density would primarily affect the Alexander Archipelago wolf. Existing road densities may already limit the suitability of the peninsula for wolves, by providing access for humans, and thus making the wolves more vulnerable to harvest through both legal and illegal hunting. In addition, increased road access for deer hunters may reduce numbers of the wolves' primary prey, Sitka black-tailed deer. Lastly, roads may increase the hunting efficiency of wolves on deer by providing convenient travel corridors that wolves may use to hunt deer, especially if timber harvest further fragments and isolates the best winter habitat for deer on the peninsula. Improving the wolves' hunting efficiency while the deer population is at a relatively low level may make the predator-prey relationship unstable and inhibit the further recovery of the local deer population.

Table 4-18 shows predicted road densities for the Lindenberg Peninsula for each action alternative. Standards and guidelines for evaluating impacts of road density on wolves state that skiff-accessible shoreline should be included in road density calculations. The current road density, including development and temporary roads, as well as skiff-accessible shoreline (estimated at 60 percent of the project area shoreline), is 0.95 mi/mi^2. Predicted road densities for the project area range from 1.14 to 1.24 mi/mi^2 under the various action alternatives. Although temporary roads can technically be excluded from road density calculations when the roads are obliterated, they would remain the primary travel corridors for humans traveling on foot; therefore temporary roads were included in the calculations. The predicted road densities with the temporary roads excluded, including skiff-accessible shoreline, range from 1.09 to 1.17 mi/mi^2 (Table 4-18).

Habitat Capability Model Results

Predicted changes in carrying capacities for TES animal species that are also MIS in the South Lindenberg area were displayed in Table 4-19. Based solely on modeled habitat capability for deer, the carrying capacity (in whole animal increments) of the South Lindenberg project area to support wolves would remain unchanged, and the carrying capacity for bald eagles (also in whole animal increments) would also remain unchanged.

Species-Specific Impacts

Alexander Archipelago Wolf

Alexander Archipelago wolf packs are typically made up of 8–9 individuals and packs defend home ranges of approximately 100 mi^2, regardless of the number of wolves in the pack (Kirchhoff et al., 1995). Most activity (approximately 75 percent) takes place in "core areas," which average 38 mi^2 in size (Kirchhoff et al., 1995). A strong relationship between road density and the presence or absence of wolves has been demonstrated by several studies in North America (Fuller, 1989; Jensen et al., 1986; Mech et al., 1988; Thiel, 1985). The findings indicate that wolves are generally not present where density of roads exceeds 0.93 mi/mi^2. Core home ranges are generally located in the least-densely roaded areas of the home range (Kirchhoff et al., 1995). Based on the results of wolf studies on Prince of Wales Island, the Lindenberg Peninsula possibly could support a single wolf pack, which would also likely use portions of the wilderness to the north of the project area. Neither the wilderness area or the Lindenberg Peninsula is likely to contain sufficient area alone to support a pack's entire home range.

The entire population of the Alexander Archipelago wolf throughout its range is believed to number only about 900–1000 individuals (Kirchhoff et al., 1995; Person and Ingle, 1995). Despite this relatively low population size, and the fact that this subspecies is a Category 2 candidate for listing under the Endangered Species Act, hunting of the subspecies is currently allowed (1994 ADF&G hunting regulations for Game Management Unit (GMU) 3 allowed a bag limit of five wolves during the season 1 August to 30 April). Hunting, trapping, and illegal killing account for most mortality of wolves even in protected populations (Peterson et al., 1984; Ballard et al., 1987; Fuller, 1989). Mortality of the Alexander Archipelago wolf is significantly correlated with road density throughout their range and increases sharply in WAAs with road densities exceeding 0.4 mi/mi^2 (Kirchhoff et al. 1995). Most wolves (55 percent) in Southeast Alaska are killed along the shoreline by hunters using boats; however, a large and increasing percentage are now being taken by hunters using the road system (44 percent) (ADF&G, unpublished data, cited by Kirchhoff et al. 1995).

New roads would allow access into several previously undisturbed watersheds, and human hunting pressure and hunting success in these areas are likely to increase as a result. This may affect an already small population of wolves predicted to reside on the Lindenberg Peninsula. In addition, wolves in Southeast Alaska are known to make extensive use of logging roads, and it is conjectured that they might take advantage of logging roads as convenient travel corridors to access patches of old-growth deer winter range and increase their hunting efficiency. Thus, roads may concurrently increase the susceptibility of wolves to hunting by humans and increase the susceptibility of deer to predation by wolves.

A forest-wide program to reduce human-caused mortality of wolves due to roads is described within the Standards and Guidelines proposed for the Draft Forest Plan Revision (USDA Forest Service, 1991b). Standards and Guidelines for the Alexander Archipelago wolf recommend road densities of no more than 1 mi/mi^2 of open road in WAAs "where wolf shooting and trapping success is very high in relation to expected total populations in combination with cooperation of ADF&G to regulate trapping and shooting" (USDA Forest Service 1991b). In WAAs that adjoin Wilderness or roadless areas of greater than 40,000 acres (WAA 5138 is adjacent to a Wilderness of 50,619 acres [79 mi^2]), an open road density of 1.2 mi/mi^2 may be allowed. For the calculation of road densities, "in areas where the coastline provides access to wolves comparable to road access, the length of the coastline should be considered in road management plans." The determination of what is "very high" shooting and trapping success for a species that exists in very low numbers to begin with is not specified, and is assumed to be a subjective decision.

Predicted road densities calculated using the guidance within the Standards and Guidelines (using skiff-accessible shoreline and not including temporary roads) for the Lindenberg Peninsula range from 1.09 to 1.17 mi/mi^2 under the various action alternatives. Technically, the road densities in the project area do not exceed Standards and Guidelines for Alexander Archipelago wolf because the WAA is adjacent to a Wilderness area. They do exceed road densities documented in the scientific literature to preclude wolf use where wolves are hunted and trapped by humans (0.93 mi/mi^2). In addition, they are more than double the road density that has been found in recent studies on Alexander Archipelago wolves in nearby GMU 2 to result in sharply increased wolf mortality from human-caused mortality (0.4 mi/mi^2).

The most important project impacts potentially affecting wolf populations in the area are increased road density and loss of habitat capability for Sitka black-tailed deer. Those alternatives that limit the building of new roads (especially those encroaching on proposed WRAs or adjacent wilderness areas), those that avoid harvesting areas of higher habitat value for deer, and those that maintain Skogs Creek watershed as a roadless area are expected to have the least impacts on wolf populations. All action alternatives increase road densities to levels that have been determined by studies in other areas to result in the abandonment of an area by wolves due to increased human-caused mortality and avoidance of human disturbance. All action alternatives would also reduce Sitka black-tailed deer habitat capability. The U. S. Fish and Wildlife Service's determination not to list this wolf subspecies as threatened was predicated upon the Forest Service's commitment to protect viable populations within the Tongass National Forest (USFWS, 1995). In addition, there is direction in the MOU to prevent the need for future listing of species by providing for suitable conservation of them. All action alternatives may result in a diminished distribution of wolves within the Peninsula and on Kupreanof Island due to increased road densities and loss and fragmentation of deer habitat. The increases in road density proposed for the South Lindenberg project may result in an increase in legal and illegal wolf hunting to unsustainable levels and will decrease the suitability of the peninsula for supporting a pack's core area. These impacts to Alexander Archipelago wolves are likely to be contingent upon the amount of use this area receives in the future.

Queen Charlotte Goshawk

Timber harvest and road construction proposed for the South Lindenberg project are predicted to negatively affect the Peninsula's nesting population of Queen Charlotte goshawk. These activities will remove old-growth forest nesting and foraging habitat and may disrupt nesting and behavior, which would directly affect reproductive success. Most impacts would result from the removal of high volume old-growth timber from within goshawk foraging areas. Table 4-26 shows the amount of old-growth forest harvested within

a 6,000-acre Foraging Area surrounding each nest. The harvest of old-growth, when paired with harvest rotations under about 200 years, represents permanent removal of suitable goshawk nesting and foraging habitat. Other impacts would be short-term and would result from road construction, log truck hauling, and timber harvest activities occurring within goshawk home ranges during the breeding season. Since very little is yet known about Queen Charlotte goshawk habitat requirements on the landscape scale, it is difficult to predict the potential impacts to goshawk that may result from the project.

The Mountain Point nest site is located about 330 feet north of a road corridor for the Skogs Creek watershed (road segment 43520-E) proposed under alternatives 3 and 4. It was determined that there was no feasible alternative location for the routing of this road. The construction of this road and the continued disturbance from hauling activities at this proximity to an active nest site during the breeding season may

Table 4-26

Habitat Composition and Potential Maximum Harvest of 6,000-Acre Circular Foraging Areas Around Known Nests of Queen Charlotte Goshawk

Nest Location	Volume Class	Old-Growth Within 6000-Acre Foraging Area[1] (acres)	Amount Represented by Volume Class (%)	Within 6000-Acre Foraging Area Amount of Old-Growth Forest Harvested							
				Alternative 2		Alternative 3		Alternative 4		Alternative 5	
				acres	%	acres	%	acres	%	acres	%
Mitchell Creek	4	1,172.5	43	93.3	8	78.7	7	96.1	8	50.8	4
(G1)	5	1,531.1	57	135.5	9	128.8	8	167.1	11	32.8	2
	6	1.0	0	0	0	0	0	0	0	0	0
	4,5,& 6	2,703.6	--	230.4	8	207.5	8	263.2	10	83.6	3
Mountain Point	4	747.0	57	7.9		19.3	3	8.1	1	11.2	1
(G2)	5	363.7	28	0	0	5.9	2	5.9	2	0	0
	6	204.3	15	32.8	16	43.0	21	2.6	1	40.5	20
	4,5,& 6	1,315.0	--	40.7	3	78.8[2]	6[3]	27.2[2]	2[3]	51.7	4
Duncan Creek	4	1,959.4	67	181.2	9	134.1	7	214.2	11	167.1	9
(G3)	5	471.4	16	50.2	11	50.2	11	50.2	11	50.2	11
	6	513.9	17	73.0	14	54.8	11	73.0	14	54.8	11
	4,5,& 6	2,944.7	--	304.4	10	239.1	8	337.4	11	272.1	9

[1]Includes only land owned by Forest Service.
[2]Amount includes 10.6 acres of road area constructed on State-owned lands. Volume class data for State-owned lands was not available.
[3]Percentage based on 1325.6 total acres (includes 10.6 acres of State-owned lands).

result in nest abandonment at any stage of nesting. During the 1994 nesting season, the Mountain Point nest successfully fledged young indicating that this area contains suitable nesting and foraging habitat for goshawk. The proposed harvest would remove a small amount of old-growth at a good distance from the nest area and would not be expected to significantly reduce the amount of available foraging habitat in the Mountain Point goshawk home range.

The Mitchell Creek nest site may be affected by road construction, hauling disturbances, and timber harvest. The Mitchell Creek nest site is located approximately 0.4 miles from an existing road that parallels Mitchell Creek in the interior of the peninsula. It is not known whether this nest area was used during previous harvest periods. Logging truck hauling along this existing road during the nesting season might result in nest abandonment or

disruption of foraging activity in this area. Under alternatives 2, 3, and 4, a new road is proposed for construction (road segment 43527) within about 0.6 miles of the Mitchell Creek nest. If new road construction occurs during the nesting season, it may displace foraging activities in the area making it necessary for birds to travel farther afield for prey. The harvest of high volume timber habitat within the home range of this goshawk pair would permanently reduce high quality foraging area available in the vicinity of the nest and might subsequently reduce reproductive success. Impacts to the Mitchell Creek goshawk nesting pair resulting from mechanical disturbance connected with road construction, hauling activities, and timber harvest are possible, but presumably the farther a nest is from an active road or harvest unit, the less impact there will be.

All action alternatives propose road construction at a distance of about 0.65 miles from the Duncan Creek nest site. In addition, a substantial amount of high volume timber would be removed from the pair's foraging range in all action alternatives. There is not enough data from Southeast Alaska goshawk studies to assess the potential impacts that may result from this level of activity. However, road construction and logging that occurs during the breeding season may result in avoidance of a large area that constitutes the most likely foraging habitat for this pair. Necropsy findings from dead northern goshawks in studies in Southeast Alaska have indicated that low prey availability and accessibility may have contributed to their mortality. Harvest of high volume timber in the foraging range of the Duncan Creek pair may have adverse effects on their reproductive success if Lindenberg Peninsula birds are suffering from low prey availability or accessibility. Given these factors, the Duncan Creek nest site might be somewhat impacted by the proposed project, however, due to its proximity to the designated wilderness area to the north, these impacts may be lessened.

Marbled Murrelet

Marbled murrelet populations in the Lindenberg Peninsula would be affected in the short-term by direct mortality of eggs and nestlings, and by reduced reproduction during nesting seasons where management activities may cause disturbance to nesting birds. The population is expected to be reduced in the long-term, and perhaps permanently, due to reduced availability of suitable old-growth nesting habitat and increased nest predation resulting from increased edge habitat.

Timber harvesting in California, Oregon, Washington, and British Columbia has reduced old-growth forest habitat by an estimated 83-90 percent and is credited with the decline and fragmentation of marbled murrelet populations in these areas (Piatt and Naslund, 1995; Rodway et al., 1992; Sealy and Carter, 1984). Although Southeast Alaska still supports a comparatively large population of marbled murrelets, the species appears to be declining in the area due to an extremely low reproductive rate and a probable increase in adult mortality (Piatt and Nashland, 1995). Therefore, murrelets should receive consideration in timber harvest plans for the Tongass National Forest if they are to maintain viable populations in the long-term and not suffer the declines of the species noted in the remainder of their range.

A single survey for marbled murrelet occupancy, using the intensive inventory method (see Chapter 3), was conducted in one-half of the units in the total unit pool. Although it is difficult to draw conclusions about the distribution of nesting murrelets within the peninsula based on single survey results conducted at these stands, the 1994 field surveys indicated higher levels of activity and occupancy behaviors in some stands. Areas where occupancy behaviors were observed, especially where combined with high levels of detections, were considered of highest importance to marbled murrelets nesting in the project area. Surveys documented relatively high murrelet activity rates in the Skogs Creek and Colorado Creek watersheds, as well as other scattered locations on the peninsula. To better protect murrelets action alternatives are preferable that (1) limit timber harvest in these areas, (2) harvest a lesser amount of Volume Class 6 old-growth forest habitat, and (3) limit road density and therefore the associated edge effect of increased nest predation.

Other TES Animal Species

Spotted frogs were not observed in the project area during the 1994 field surveys. Impacts of the proposed management activities on spotted frog populations, if present, would probably be minimal because of protection afforded to stream buffers and wetland areas.

The proposed project is predicted to incur minimal impacts to humpback whales (and other marine mammals) that may be found in the waters surrounding the Lindenberg Peninsula. Impacts would be limited to encounters of whales with boats that are transporting personnel, equipment, and timber to or from the Tonka LTF. It is likely that the amount of marine traffic associated with the project would be significantly less than the general traffic associated with the Inland Passage through Wrangell Narrows.

No active osprey nests were found in the project area in 1994. The proposed management actions are not expected to have detrimental impacts on osprey because all action alternatives are going to leave reserve clumps of trees within harvest units. These leave trees may be the preferred nesting habitat of osprey in Southeast Alaska because of competition with bald eagles for shoreline nesting areas.

The protection of the beach fringe habitat is assumed adequate for protecting breeding populations of bald eagles within the project area. Therefore, impacts of the proposed project are not expected to significantly reduce the population of this species. Data from the habitat capability modeling indicates no loss of predicted carrying capacity for bald eagles in alternatives 2 and 5, and an insignificant loss in alternatives 3 and 4, based on breeding habitat. It is possible that increased boat traffic near the LTF might somewhat disturb foraging behavior of eagles nesting in the vicinity, but it is likely that birds in the region are relatively habituated to the presence of boat traffic. In addition, this impact would be short term and would not affect the maintenance of viable populations of bald eagles in the project area.

Consequences Specific To Action Alternatives

A comparison of the effects of the management alternatives on TES animal species is discussed below.

Alternative 1

The Lindenberg Peninsula currently sustains use by Alexander Archipelago wolves. Habitat capability based solely on potential deer habitat capability suggests that the project area could support about 4 wolves. This model does not take into account home range requirements, road density, or harvesting of wolves by humans. The current road density, including development and temporary roads, as well as skiff-accessible shoreline, is within the standards and guidelines for wolves, but may nonetheless reduce the habitat value of the area for wolves based on studies in other areas of Southeast Alaska. Suitability of the area for wolves may vary with the amount of use the peninsula receives from humans.

Existing conditions appear sufficient to support at least three breeding pairs of Queen Charlotte goshawk on the Lindenberg Peninsula in the long-term. Alternative 1 would preserve existing habitat conditions and would entail no further impacts on nest sites of resident breeding pairs.

Existing conditions in the Lindenberg Peninsula appear to support a substantial population of marbled murrelets. It is not known whether the present population is stable or may be declining due to increased edge habitat from past management activities and increases in adult mortality from fishing nets. The maintenance of existing conditions in the project area would have the highest likelihood for maintaining a population of marbled murrelets in the peninsula. Overall, Alternative 1 would provide the best protection for TES animal species.

Alternative 2

Of the action alternatives, Alternative 2 proposes the second-lowest road density for the analysis area, in part due to economic considerations. However, even this density may adversely affect wolf populations due to enhanced hunting and poaching access. Alternative 2 proposes the highest amount of harvest of Volume Class 6 old-growth forest among the alternatives. Volume Class 6 old-growth is important habitat for Sitka black-tailed deer, which are the primary prey of Alexander Archipelago wolves.

Loss of old-growth habitat and creation of habitat edges are consequences of clearcut harvest

Because no road is proposed into the Skogs Creek watershed, this alternative would avoid direct disturbance to the Mountain Point goshawk nest site. Harvest within the 6,000-acre Foraging Area would be limited to approximately one-half of Unit 105; such would remove only a small percentage of the available old-growth in the delineated Foraging Area. This alternative would remove 16 percent of the highest volume (Volume Class 6) old-growth in the project area. The Mitchell Creek nest site might be affected by the harvest of several units (55, 56M, 60, 141, and 148) and the building of Road Segment 43527 and other small spur roads within the 6,000-acre Foraging Area. Based on radio telemetry data and on the 6,000-acre Foraging Area, Mitchell Creek nesting goshawks would lose somewhat less than 10 percent of the old-growth habitat within their foraging range. The nearest proposed road would be 0.6 miles from the nest site. The Duncan Creek nesting site would be potentially affected by the construction of a road 0.65 miles from the site, and by the harvest of several units (2, 4, 6, 16, 19, 150, and part of 44) within the 6,000-acre Foraging Area. This alternative proposes the harvest of about 10 percent of the old-growth (including 14 percent of the Volume Class 6 old-growth) within the Foraging Area.

Alternative 2 proposes to conduct timber harvest in the medium WRA proposed for the southern tip of the peninsula. Marbled murrelet occupancy behaviors and high levels of

murrelet activity were observed in stands within this area. Harvest within this area, and the relatively high harvest level of Volume Class 6 old-growth habitat, would reduce the carrying capacity of the project area for murrelets. Alternative 2 proposes clearcutting the following units in stands where marbled murrelet occupancy behaviors and relatively high activity levels were observed—16, 32, 62/63, 69, 119, 129, 133, and 136. However, the relatively low road density in this alternative would somewhat limit the creation of additional forest edge.

Alternative 3

Alternative 3 projects the highest road density of all alternatives, which is expected to have the greatest adverse impacts to wolf populations, due to increased potential for human access.

Alternative 3 proposes the building of a road into Skogs Creek watershed passing within 330 ft of the Mountain Point goshawk nesting site, which would violate the 1992 Interim Habitat Management Recommendations for Northern Goshawk (USDA Forest Service 1992b). If the nest site was active at the time of construction, it could be abandoned due to management-related disturbance. A negligible amount of old-growth would be harvested within the Mountain Point 6,000-acre Foraging Area. Alternative 3 proposes the cutting of several units (55, 57, 58, 60, 141, and 148) and the construction of Road 43527 (within 0.65 miles of the nest site) and some spur roads within the 6000-acre Foraging Area of the Mitchell Creek nest site. Selective harvest within units 57 and 58 is allowable under the 1992 Interim Habitat Management Recommendations for Northern Goshawk (USDA Forest Service, 1992b) but harvest would not be allowed under the 1994 draft Environmental Assessment (USDA Forest Service, 1994b). Based on either radio telemetry data or the assumption of a 6,000-acre Foraging Area, approximately 10 percent of the old-growth within the foraging area would be removed. Because of its inclusion of the harvest units closest to the nest site (units 57 and 58), this alternative may result in adverse impacts to the Mitchell Creek nest site. Under Alternative 3, the Duncan Creek nest site would possibly be affected by the harvest of several units (2, 6, 16, 19, 44, and 150) within the 6,000-acre Foraging Area, and disturbance from constructing a road within 0.65 miles of the nest site. Approximately 11 percent of the old-growth within the delineated 6,000-acre Foraging Area would be removed.

Alternative 3 proposes to conduct timber harvesting and road construction within the currently undisturbed Skogs Creek watershed where high levels of murrelet activity and occupancy behaviors were observed. Alternative 3 proposes the most road construction of all action alternatives and would therefore be expected to result in the highest impacts to nesting success from increased nest predation along road edges. Alternative 3 proposes clearcutting the following units in stands where marbled murrelet occupancy behaviors and relatively high activity levels were observed—16, 32, 62/63, 69, 90, and 96.

Alternative 4

The relatively high overall road density proposed in Alternative 4 (the second-highest of the alternatives) and the construction of the Skogs Creek road into this currently undisturbed watershed would be expected to have negative impacts on the Alexander Archipelago wolf due to increased potential for human access.

The Skogs Creek road would be located within 330 ft of the Mountain Point nest site, in violation of the 1992 Interim Habitat Management Recommendations for Northern Goshawk. No harvest units are proposed within the 6,000-acre foraging area of the Mountain Point nest site. Alternative 4 proposes the clear-cutting of several units within the 6,000-acre Foraging Area of the Mitchell Creek nest site (units 55, 56M, 58, 60, 141, and

148) and proposes the building of Road 43527 (within 0.65 miles of the nest site) and some spur roads, which are located within the foraging area of the Mitchell Creek nest site. Approximately 14 percent of the old-growth habitat within the Mitchell Creek 6,000-acre Foraging Area would be harvested. The inclusion of so many units within the foraging area and of one of the harvest units closest to the nest site (Unit 57) might result in adverse impacts to the Mitchell Creek nest site, although impacts are predicted to be less than those that may result from Alternative 3. The Duncan Creek nest site would be potentially affected by harvest of several units (2, 4, 6, 16, 19, 20, 44, and 150) within the 6,000-acre Foraging Area and disturbance from constructing a road within 0.65 miles of the nest site. Under Alternative 4, about 14 percent of the old-growth forest within the 6,000-acre Foraging Area would be clear-cut.

Alternative 3 proposes to conduct timber harvesting and road construction within the currently undisturbed Skogs Creek watershed, where high levels of murrelet activity and occupancy behaviors were observed. Because Alternative 4 proposes a relatively high amount of road construction, it would be expected to result in more negative impacts to nesting success resulting from increased nest predation along road edges than would occur under alternatives 2 or 5. Alternative 4 proposes harvesting the following units in stands where marbled murrelet occupancy behaviors and relatively high activity levels were observed: 16, 32, 62/63, 69, 90, 96, and 114.

Alternative 5

Alternative 5 was configured to account for the habitat requirements of several old-growth-dependent or otherwise sensitive wildlife species and to maintain large unfragmented blocks of old-growth habitat. For these reasons, it tends to concentrate harvest in areas that have been previously impacted by road construction and timber harvest. In common with all alternatives, it refrains from harvest and road building in several undisturbed and roadless areas in order to provide for a system of WRAs that may be used in future Forest Plans for the Tongass National Forest to ensure well-distributed viable populations of wildlife. Alternative 5 proposes to build the least amount of roads of all alternatives and therefore would result in the lowest road density. Alternative 5 does not propose to build a road into the Skogs Creek watershed or into the areas proposed as small and medium HCAs. It also does not propose new roads in upper Mitchell Creek watershed (road segment 43527).

For the above reasons, Alternative 5 is most likely, of the action alternatives, to protect Alexander Archipelago wolves in the Lindenberg Peninsula. For Queen Charlotte goshawk, Alternative 5 is not predicted to affect the Mountain Point nest site. This alternative proposes the least harvesting within the foraging area of the Mitchell Creek nest site, only including two harvest units (60 and 148) that are located at distances of over 1.2 miles from the nest that was active in 1994. It proposes no harvesting or road construction within the 1,600 acres delineated as WRA 437 that includes the Mitchell Creek nest location. In addition, it does not propose the construction of Road 43527, which is within about 0.65 miles of the nest site. This alternative therefore avoids impacts that would result from the construction of this road and logging in the close vicinity of the Mitchell Creek nest site. However, Alternative 5 does propose several harvest units (2, 6, 16, 19, 20, 44, and 150) within the 6,000-acre Foraging Area of the Duncan Creek nest site, and construction of a road within 0.65 miles of the nest site. Approximately 11 percent of the old-growth within the Duncan Creek 6,000-acre Foraging Area would be harvested. The proximity of this nest area to the wilderness area may ameliorate this impact of the project. Of the action alternatives, Alternative 5 best protects the integrity of the home ranges of the confirmed goshawk nests in the South Lindenberg project area from further old-growth harvest and fragmentation. Therefore, Alternative 5 is predicted to result in the least impact, of the action alternatives, to known nesting sites of Queen Charlotte goshawks within the project area.

With the lowest construction of new roads and lack of road construction into the Skogs Creek watershed, Alternative 5 is expected to result in the least impacts to marbled murrelets from edge-related effects. Alternative 5 proposes clearcutting the following units in stands where marbled murrelet occupancy behaviors and relatively high activity levels were observed—16, 32, 62/63, and 69. Alternative 5 is expected to result in the least impact of all action alternatives to the nesting population of marbled murrelets in the Lindenberg Peninsula.

Cumulative Effects

Cumulative effects result from summation of past, present, proposed, and foreseeable activities in the South Lindenberg project area. See the Biodiversity section for an evaluation of the loss and fragmentation of forest in the area since the first harvest entry in the 1930s. As addressed in the Wildlife section, these cumulative impacts to wildlife resources in the South Lindenberg project area are most apparent as loss of wildlife habitat. Despite past harvest, breeding goshawks and marbled murrelet presently inhabit the South Lindenberg area. Further reductions in old growth habitat may reduce the carrying capacity of the area for these species, but will not likely cause complete extirpation of these species from the project area. The proposed project would represent a portion of the habitat loss that will continue to occur throughout the ranges of the Alexander Archipelago wolf, Queen Charlotte goshawk, and marbled murrelet. In addition, the cumulative effects of expanding the road system in the project area is likely to contribute to the overall decline of the Alexander Archipelago wolf in the Tongass National Forest although this impact is contingent upon the level of human use the area receives in the future.

Mitigative Measures and Monitoring

Mitigation Measures

This section lists the mitigation measures that have been incorporated into one or more action alternatives that will serve to reduce project impacts on Alexander Archipelago wolf, Queen Charlotte goshawk, and marbled murrelet. Additional mitigation measures for other wildlife species in the project area can be found in Chapter 4—Wildlife. In addition to the mitigation measures which are included in the action alternatives for this project, this section includes "appropriate mitigation measures not already included in the proposed action or alternatives" as directed by Council on Environmental Quality regulations (40 CFR Sec. 1502.14[f]). The reasons for the exclusion of these mitigation measures in the alternatives are discussed, and the potential benefits in reducing project impacts to wildlife that would possibly result from their implementation are explored.

Most of the mitigation measures for wildlife (see Wildlife section of Chapter 4) would also apply to TES animal species. In addition to those, the following mitigation measures that reduce impact to TES animal species **are included** in all action alternatives:

- restriction on timber harvest in 20-acre goshawk Nest Areas,
- timing restrictions for mechanical disturbance within 20-acre goshawk Nest Areas,
- restrictions on amount of timber harvest to occur in 6,000-acre goshawk Foraging Area,
- 300-foot windfirm buffers for confirmed active nests of marbled murrelets, and
- timing restrictions for mechanical disturbance within 1/8 mile of confirmed active nests of marbled murrelets.

The following mitigation measures **are added** to the above for one or more action alternatives (in addition to those included under Mitigation in Wildlife section):

- limitations on timber harvest within 6000-acre goshawk foraging areas.

The following mitigation measure **is added** to the above for Alternative 5 (in addition to those included under Mitigation in Wildlife section):

- avoidance of harvest in areas with high levels of marbled murrelet activity or occupancy behaviors.

The following mitigation measures **were not** included as part of any action alternative. Some of these mitigation measures may only be addressed at the Forest Plan level:

- timing restrictions or timber harvest restrictions for areas occupied by marbled murrelets,

- prohibition on harvest in 6,000-acre Foraging Area for active goshawk nests, and

- restrictions on hunting and trapping of wolf in reserve areas.

Mitigation to Reduce Impacts Resulting From Loss of Old-Growth Forest Habitat

A general discussion of the use of retention or reserve areas as mitigation for loss of old-growth forest habitat is presented in the Chapter 4—Wildlife Section.

Provision for Wildlife Retention Areas

In addition to depicting Wildlife Retention Areas" (WRAs), Figure 4-6 in the Chapter 4 Wildlife section also shows a Queen Charlotte goshawk "Post-Fledging Area" (PFA) delineated so as to comply with habitat management guidelines for northern goshawk (USDA Forest Service, 1992b; USDA Forest Service, 1994b). Table 4-21 lists relevant acreages for the PFAs as configured for the project.

Because the three active goshawk nests happened to be located in three different VCUs of the analysis area, the WRAs were placed so as to maximize protection of goshawk nests. Since the WRAs were formulated to comply with the recommendations for a small HCA, these WRAs met all recommendations of the Vi-Pop group for goshawk Post-Fledging Areas. This strategy complied with all management directions that were in effect during the planning processes associated with this EIS.

WRA 439—A PFA within this WRA has not been formally delineated around the Duncan Creek goshawk nest, because the protection afforded by designation as a WRA exceeds criteria for a PFA.

WRA 437—A PFA within this WRA has not been formally delineated, as the protection afforded by designation of the area as a WRA exceeds criteria for a PFA. This WRA contains three proposed units. Units 57 and 58 are included in alternatives 3 and 4; selective harvest would be permitted and compliance met for the 1992 Interim Habitat Management Recommendations for Northern Goshawk (USDA Forest Service, 1992b) but would not be in compliance for the goshawk habitat management strategy outlined in a 1994 draft Environmental Assessment (USDA Forest Service, 1994).

PFA 447—A separate region for a goshawk PFA was identified for the Wrangell Narrows nest location because of the lack of contiguous old-growth on Forest Service lands around this nest. The PFA region was configured around the Wrangell Narrows goshawk nest location, using landscape-level boundaries to define the extent of the PFA coupled with the need to include 600 acres of old-growth. As determined by GIS, the mapped PFA is 1,607 total acres of Forest Service-owned land, of which 406 acres are Volume Class 4 forest and 244 acres are Volume Class 5 and above (totaling 650 old-growth acres).

Adequacy of Proposed WRAs to Support Viable Populations of TES Species—The retention areas as configured for Alternative 5, which do not include any construction or harvest occurring within the proposed WRAs, are expected to maintain sufficient habitat so that successful Queen Charlotte goshawk and marbled murrelet reproduction can continue to occur within project area. Alternatives that propose road construction within or near the retention areas are expected to be less effective in reducing project impacts to TES species. Because small retention areas as configured for the project would be insufficient to provide for the core area of a pack of Alexander Archipelago wolves, habitat protection and disturbance impacts on this species must be looked at on a larger scale. The medium WRA may be large enough to provide an undisturbed denning area for wolves, however, shoreline access in this area may cause avoidance by wolves or higher human-caused mortality. Therefore, designation of retention areas alone may not provide a sufficient area of undisturbed habitat capable of supporting a pack's core area.

Protection of Skogs Creek Watershed—Under alternatives 2 and 5, Skogs Creek watershed would remain in an undisturbed and roadless condition for the life of the project. Maintaining the currently-unmanaged character of this watershed is likely to greatly reduce impacts of the project on wolves, goshawk, and marbled murrelet. Skogs Creek area was observed to have some of the highest levels of marbled murrelet breeding activity in the project area. Protection of the area would reduce impacts to marbled murrelets from edge effects due to forest fragmentation. Impacts to wolves would be reduced by protection of this watershed because the area would remain fairly inaccessible to humans. Benefits to wolves in the watershed would include: (1) buffering of deer populations from increased human hunting, (2) reduced hunting and trapping mortality of wolves, (3) maintenance of natural predator-prey dynamics, and (4) affording wolves a relatively inaccessible area in which to den. Because a goshawk nest that successfully fledged at least two young in 1994 is situated within the area, it is believed to also contain good foraging habitat for this species.

Long-Term Protection of Reserve Areas—Protection of WRAs and the Skogs Creek watershed would be effective for the life of the project only. Long-term protection of reserves is a land allocation decision that can only be made at the Forest Plan level. Maintenance of breeding wolves, goshawks, and marbled murrelets in the project area may be impossible without provision for long-term protection of some undisturbed, unfragmented, and roadless areas. A strategy for a system of permanent Habitat Conservation Areas is being considered in the most recent Draft Forest Plan Revision.

Alternative Silviculture

As described in the Chapter 4 Wildlife section, group selection cuts will be used in nine units instead of clearcutting. All of these units will be logged by helicopter in 1½- to 2-acre patches. This mitigation measure will leave old-growth trees and associated biota within the stand and will reduce impacts to some old-growth-dependent wildlife species. However, edge effects are likely to occur with this type of treatment and so reduction of impacts to marbled murrelets may not be significant. Impacts on Queen Charlotte goshawk should be reduced in comparison to clearcut areas.

Timber Harvest in Proportion to Available Area of Each Volume Class in the Project Area

This mitigation measure was not included in the action alternatives because its value to wildlife and TES animal Species would be questionable. Harvest of timber volume classes in proportion to their availability in the project area would require cutting of more acreage of lower volume class timber if the same amount of timber volume is to be taken. However, this mitigation measure could result in greater impacts on marbled murrelets because it would result in more road construction and forest fragmentation. It could possibly reduce impacts to goshawk, which may preferentially forage in Volume Class 6 habitat. This measure could possibly reduce impacts to wolves, because the highest quality deer winter range would be protected; however, the negative impacts of higher road density would be expected to negate any benefits to wolves.

Mitigation to Reduce Impacts Resulting From Increases in Forest Fragmentation and Edge Effects

The TES species that is expected to be most negatively impacted by increased forest fragmentation and edge effects in the project area is marbled murrelet because increased nest predation may result from forest fragmentation. Mitigation measures that may reduce impacts to marbled murrelets resulting from forest fragmentation include the preservation of large unfragmented old-growth areas and restoration of roads to pre-project conditions (these two measures are discussed elsewhere in this section).

Provisions for Wildlife Corridors

TES species in the project area would not likely be significantly impacted by the absence of old-growth forest corridors between areas of suitable habitat. Marbled murrelets and Queen Charlotte goshawks both can disperse across open or fragmented landscapes easily. Wolves are also known to cross open or fragmented landscapes, often traveling at night where human disturbance is present. Benefits of corridors for other wildlife species are discussed in Chapter 4–Wildlife.

Protection of Stream Buffers and Beach Fringe

A 100-foot buffer strip for all salmonid-bearing streams is included in all of the action alternatives for the South Lindenberg project. In addition, a 500-foot beach fringe area is to be protected under all alternatives. These measures will reduce impacts on marbled murrelets and Queen Charlotte goshawks by preserving old-growth forest nesting and foraging habitat in the project area. However, marbled murrelets nesting in these areas may be more vulnerable to nest predation because of edge effects and large numbers of corvids (especially northwestern crow) along shoreline areas.

Mitigation to Reduce Impacts Resulting From Increased Road Density

Most impacts predicted to result from increased road density on TES species are related to the higher levels of legal and illegal hunting and trapping of wolves that occurs along roads. Mitigation measures that could be used to reduce impacts of roads include barriers to public use and the permanent abandonment and revegetation of roads. The following sections discuss the potential effectiveness of mitigation measures to reduce impacts of roads on Alexander Archipelago wolves. Other discussion on the effectiveness of mitigation measures for other wildlife species can be found in the Chapter 4—Wildlife section.

Closure of Temporary Roads By Use of Barriers

Road closures have been shown to have little mitigating effect on Alexander Archipelago wolf mortality that is caused by human hunting and trapping. In Southeast Alaska, Kirchhoff et al. (1995) have stated that "administrative road closures have had little effect. Infrared traffic sensors reveal that roads posted as closed received the same level of use as similar unposted roads (Person, unpublished data). Physical barriers can be constructed, but all too often these are circumvented. Once a road is in place, practical constraints make it very difficult to control access." Since off-road vehicles are used more often than cars or trucks by hunters in the project area, road barriers may be ineffective at preventing access.

Road closures will not reduce impacts on marbled murrelets that may result from road construction because edge effects will be permanent unless roads are restored. Impacts on marbled murrelets resulting from increased edge effects will remain unmitigated and irreversible under all action alternatives.

Abandonment and Revegetation of Roads

Because of the potential for illegal hunting and the difficulty of enforcing hunting and trapping restrictions, wolves may not persist in densely roaded areas even with complete regulatory protection from hunting and trapping. Permanent abandonment and revegetation of roads for the purposes of reducing road densities would gradually reduce impacts to wolves resulting from road construction in the long term. As human access became more difficult, hunting and trapping mortality of wolves would be expected to decrease. Over the long term, the restoration of some roads may be the only mitigation measure that will insure the long-term maintenance of viable populations of wolves in the portions of the Tongass National Forest that have been exploited for timber harvest. Restoration of certain roads in the project area could increase the likelihood that the peninsula would remain suitable for situation of a wolf pack core area and denning site.

Hunting and Trapping Restrictions for Alexander Archipelago Wolf

Protection of Alexander Archipelago wolves from hunting in reserves or wilderness areas may partially reduce impacts of road construction on local wolf populations, depending on the level of enforcement that is feasible to provide and prevailing public attitudes towards wolves. The current level of harvest of Alexander Archipelago wolves (up to 40 percent in GMU 2) is believed to be causing declines in some sub-populations of this subspecies. If wolf populations appear to decline further in the Tongass National Forest or in GMU 3 (which includes Kupreanof Island), restrictions on legal hunting and trapping may have to be implemented to insure the persistence of the species. Enforcing restrictions on hunting and trapping of wolves would be extremely difficult, but these restrictions might reduce mortality to levels sustainable by the population. Wolf harvest data for Wildlife Analysis Area 5138 will be monitored on a continuing basis before and after management activities in order to attempt to track population responses that may result from project impacts.

Mitigation to Reduce Impacts on Queen Charlotte Goshawks and Nesting Marbled Murrelets

To prevent mortality of goshawk and murrelet eggs and young, destruction of active nests, and loss of reproductive effort by adult birds, and to allow adult birds sufficient time to relocate and renest within the same season, roads should be constructed and timber harvested as early as possible in the spring before the nesting season has advanced to any great degree. Road construction and timber harvest taking place during the nesting season will likely result in destruction of nests and mortality of young of marbled murrelets and will not be

mitigatable. Mitigation measures to prevent project impacts on confirmed active nests of Queen Charlotte goshawk and marbled murrelets are included under all action alternatives. Mitigation measures to prevent project impacts on marbled murrelet nests will only be incorporated if hard evidence of nesting is discovered.

Road Construction and Harvest Timing Restrictions for Queen Charlotte Goshawk

The Queen Charlotte goshawk has the most restrictive timing constraints due to its early nesting in the spring and to its sensitive status. In order to prevent nest abandonment by Queen Charlotte goshawks, road construction or timber harvest should occur prior to nesting activities in March or after young have fledged in mid-August to September. The 1992 Interim Habitat Management Recommendations for the Northern Goshawk in the Tongass National Forest specify that timing restrictions will apply to areas within 600 feet of a 20- to 30-acre Nest Area. No prolonged (over three days) mechanical activity (including drilling, blasting, sawing, and yarding) is to occur during the period from 15 March to 1 September. Timing restrictions on road construction and timber harvest activities may be removed after June 30, if active nests become inactive or unsuccessful. For the purposes of this project, a 20-acre Nest Area was used for calculation of distances.

Timing restrictions for road construction in the Skogs Creek watershed are included under action alternatives 3 and 4 for the Mountain Point Nest Area, because road segment (43520-E) would bisect this Nest Area at a distance of 330 feet from the nest. The nest site can be surveyed early in the breeding season to determine if the site is occupied or if birds are occupying an alternate nest site in the same territory. If the territory is occupied, road construction will be restricted on this road segment to the period prior to 15 March to 1 September. No timing restrictions on log truck hauling are mandated within the Nest Area under the 1992 Interim Habitat Management Recommendations. Timing restrictions on road construction for this road segment should minimize most impacts associated with this road to goshawks nesting in this area. The closest harvest unit to the Mountain Point nest area is 6,412 feet away. No timing restrictions for harvest will apply to this unit.

Under all alternatives except for Alternative 5, a road is proposed to be constructed at a distance of 0.6 mi (3,375 feet) from the Mitchell Creek nest site. No timing restrictions on road construction or hauling will apply to this road segment (43527), as it is further than 600 feet from the Nest Area. Timing restrictions will apply to the harvest of Unit 57 which is within 395 feet of the 20-acre Nest Area. No timing restrictions will apply to the harvest of Unit 58, which is 1,414 feet from the 20-acre Nest Area.

All alternatives propose road construction at a distance of 0.6 mi (3,400 feet) from the Duncan Creek nest site. No timing restrictions on road construction or hauling will apply to these road segments (43500-C, 43500-D and 43503) as they are further than 600 feet from the Nest Area. Unit 150, which will be logged by helicopter, is 2,627 feet from the nest and 2,100 feet from the Nest Area. Because the use of a helicopter at this distance from the nest may result in nest failure or abandonment, timing restrictions will apply to the harvesting of this unit. No timing restrictions will apply to the next nearest harvest unit, Unit 16, as it lies farther than 600 feet from the Nest Area.

Timing restrictions for mechanical disturbance occurring within the 600-acre Post-Fledging Area and 6000-acre Foraging Area are not being proposed under any of the action alternatives. In addition, telemetry data for resident goshawk pairs in the project area was not used to develop further mitigation for the project. Additional timing restrictions for those areas that fall within primary foraging areas of goshawks during the nesting season, as determined by telemetry data, could possibly further reduce impacts of the project to minimal levels. However, the lack of data on responses of Queen Charlotte goshawks to

such disturbance makes it difficult to weigh the potential benefits of such a mitigation measure.

Compliance with 1992 Interim Habitat Management Recommendations for Northern Goshawk

The "1992 Interim Habitat Management Recommendations for the Northern Goshawk" (USDA Forest Service, 1992b) were used as the minimal level of protection to be incorporated in the project analysis. Interim guidelines stipulate identification of a 20- to 30-acre Nest Area (NA) with no vegetative manipulation for confirmed nests, a 600-acre Post Fledging Area (PFA) having little commercial timber harvest, and a 6,000-acre Foraging Area (FA) in which 20 percent should be comprised of timber stands equaling or exceeding Volume Class 4. In a draft Environmental Assessment addressing viability concerns (USDA Forest Service, 1994b), changes to the goshawk habitat management guidelines were proposed that would eliminate any vegetation management within the 600-acre PFA. While all action alternatives comply with the 1992 guidelines, action alternatives 3 and 4 would not comply with the 1994 draft guidelines, as these alternatives propose harvest of units 57 and/or 58, which lie within a 600-acre range of known nest locations.

The "1992 Interim Habitat Management Recommendations for Northern Goshawk" (USDA Forest Service 1992b) call for an analysis of habitat composition of a 6,000-acre circular foraging area centered at known nest locations. Table 4-26 lists the results of this analysis, and indicates compliance with the guidelines such that 20 percent or greater of the foraging area remains as old-growth after implementation of any action alternative.

Restriction on Timber Harvest Within Goshawk Foraging Areas

Restrictions on timber harvesting within 6000-acre Foraging Areas centered on active nests of goshawks is not included as a mitigation measure for the project. The benefits of such a mitigation strategy are questionable because resident goshawk pairs do not necessarily preferentially forage in the areas thus delineated, as is evident from the telemetry data.

Road Construction and Harvest Timing Restrictions for Marbled Murrelets

Timing restrictions on timber harvest in stands occupied by marbled murrelets are not being considered by the Forest Service due to the large number of units that are occupied by marbled murrelets, the labor that would be involved in confirming nest sites, and the lack of research to determine the potential effectiveness of such a measure. It is not known whether murrelets would renest if nests are destroyed or abandoned, or if they are able to lay a second egg in a season if the first is lost. To restrict harvest to the period before eggs are laid and allow for the possibility of renesting would exclude activity from about mid-May to 1 September in Southeast Alaska. Timber harvest in occupied units and road right-of-ways from mid-May to September are expected to result in mortality of marbled murrelet eggs and nestlings that are present in these areas. This impact will remain unmitigated under all action alternatives. If an active marbled murrelet nest is confirmed within a harvest unit, a 300-foot windfirm buffer will be implemented for protection of the nest site and mechanical disturbance will be restricted within 1/8 mile of the nest during the breeding season.

Timing restrictions on timber harvest in occupied units would be more likely to reduce impacts to murrelets than timing restrictions on road construction and hauling. Although no timing restrictions are being included as mitigation for impacts on marbled murrelets, the following paragraphs discusses the potential benefits of such mitigation measures were they to be implemented.

Timing restrictions on road construction and hauling would not be expected to substantially reduce impacts to marbled murrelets. Long-term cumulative edge effects resulting from construction of roads are of much more concern than short-term impacts that may include the failure or abandonment of nests along the road corridor during the road construction and subsequent hauling of timber. However, timing restrictions would reduce direct mortality to eggs and young that may result from performing construction during the nesting season, and would possibly reduce nest abandonment and lost reproductive effort that may result from log hauling during the nesting season. In order to reduce direct mortality to eggs and nestlings, road construction would have to occur prior to the main egg-laying period that begins in late May. This mitigation measure could be applied to roads that are proposed in areas where high activity levels and occupancy behaviors of marbled murrelets were observed.

Timing restrictions on timber harvesting operations could reduce impacts to marbled murrelets that would result from direct mortality of eggs and nestlings occurring in stands proposed for harvest, and would possibly reduce impacts from nest abandonment and lost reproductive effort that may result from disturbance during the nesting season. Proper timing of harvest activities to periods before or after the nesting season (15 May to 1 September) would also possibly allow nesting murrelets to relocate to other areas, further reducing impacts of timber harvest. This mitigation measure could be recommended in areas where high activity levels and occupied behaviors were observed, such as the Skogs, Colorado, and Duncan creek watersheds in order to reduce the impacts of timber harvest on the marbled murrelet population breeding in the project area.

Monitoring Plans

Alexander Archipelago Wolf -Alexander Archipelago wolf harvest data for Wildlife Analysis Area 5138 will be monitored on a continuing basis before and after management activities in order to attempt to track population responses resulting from project impacts.

Queen Charlotte Goshawk - Three nesting areas were found to be active in the 1994 breeding season. All of these areas will be monitored each year to determine whether goshawk pairs are nesting in these areas. Surveys for goshawks using taped calls during the breeding season should allow a biologist to determine if a goshawk is in the area.

It is possible that new active nest locations of Queen Charlotte goshawk will be found during road construction or other pre-harvest activities conducted for the project. Because all active nests of the Queen Charlotte goshawk are currently required to receive protection under the "1992 Interim Habitat Management Recommendations for Northern Goshawk" (USDA Forest Service 1992b), procedures to be followed upon discovery of new nests should be outlined prior to construction activities. Road construction crews should be briefed in identification of adult birds, nest defense calls, and nest appearance, and should carry laminated cards depicting the species.

If an adult Queen Charlotte goshawk exhibiting nest-defense behavior is seen or heard during construction, work should be halted so that an attempt to locate the nest can be made. Once the nest is located, biologists can assess the potential impact to the nest of continuing construction on the proposed route. If the impact is predicted to be significant, the road could be rerouted (if possible) outside of the 20- to 30-acre nest area in order to prevent significant impact.

Marbled Murrelet - Collection of any data on marbled murrelet nesting habitat preferences and nest phenology for Southeast Alaska would be extremely valuable and aid in managing the forest in ways that will protect this species from declines in Southeast Alaska. In the event that nests, eggs, eggshell fragments, or nestlings of marbled murrelets are found and

confirmed, the Forest Service and Alaska Department of Fish and Game will be notified and appropriate action taken to collect data on the nest and/or to protect the nest if feasible. Road construction and timber harvest crews could carry laminated cards to aid in identification (which is quite straightforward in the case of murrelet eggs and nestlings). It is recommended that the following data be collected: stage of nest, nest tree species, dbh and height of nest tree, canopy closure, percent cover above nest cup, height of nest, diameter of nest branch, amount of epiphyte cover at nest, distance of nest from tree trunk, aspect, slope, and elevation at nest location, distance to edge of stand, stand size, etc. Photos of the nest site would also be of value.

Threatened, Endangered, and Sensitive Plant Species

Impacts to TES Plants

Both the Forest Plan and the Endangered Species Act of 1973 require assessment of project impacts to threatened, endangered, or sensitive plants. No federally listed threatened or endangered plant species will be affected by the South Lindenberg Timber Sale, since none occur or are known to potentially occur in the area. Although two former candidate C2 species occur in Southeast Alaska, Thurber's reedgrass (*Calamagrostis crassiglumis*) and a sedge (*Carex lenticularis* var. *dolia*), neither of these is known to occur on Kupreanof Island and therefore should not be affected. One Forest Service Sensitive species, Choris' bog orchid (*Platanthera chorisiana*), is known to occur in the South Lindenberg area, and impacts to this species will likely occur.

Since Choris' bog orchid occurs in muskeg habitat, direct impacts from timber harvesting are not expected. However, the construction of roads through muskeg may affect individuals of this species. No roads are proposed in areas mapped as muskeg, but roads are planned in areas mapped as mixed forest-muskeg, in which patches of muskeg are interspersed with forest. Specifically, 3.1, 3.6, 3.6, and 2.2 miles of road are proposed in mixed forest-muskeg under alternatives 2, 3, 4, and 5, respectively. An unquantified portion of these road miles would pass through muskeg patches and potentially affect Choris' bog orchid individuals. In one surveyed section of road, several individuals of Choris' bog orchid were found in the path of the proposed road between harvest units 93 and 96, which would be constructed under alternatives 3 and 4.

Although these and possibly other individuals of this species would be lost due to the proposed timber sale, these actions are not expected to threaten the viability of Choris' bog orchid in the South Lindenberg area or on Kupreanof Island. Since it's inclusion on the Region 10 Forest Service Sensitive Species List in January 1994, Choris's bog orchid has been found in numerous locations and appears to be more common than previously thought in Southeast Alaska (Stensvold, 1994).

Biodiversity

Impacts to biodiversity can be addressed from a variety of spatial scales, ranging from regional to local. Biodiversity on a regional scale in the Tongass National Forest has been addressed in the Forest Plan and proposed revision (USDA Forest Service, 1985-1986; 1991b). This is done primarily through Land Use Designations (LUD) that allocate land to other uses, such as preserving wildlife and other biological values, besides that of intensive timber production. Project specific impacts to biodiversity occur within the smaller spatial scale of the project area, but they also have effects on the surrounding landscape over which populations of animal and plant species are continuously distributed.

Assessment of timber harvesting impacts to biodiversity in this analysis are primarily directed at changes in habitat abundance, distribution, and value. In particular, the analysis is focused on the distribution and characteristics of old-growth habitat within the South Lindenberg area. To the extent possible from available data, cumulative impacts to old-growth forest habitat are addressed on an island-wide basis. Effects on individual elements of biodiversity, such as TES species, fisheries, and wildlife, are also assessed, drawing from other resource issues discussed in the EIS analysis, but considered here from an ecosystem perspective.

Effects of Proposed Alternatives

Habitat Heterogeneity and Distribution

Since timber harvesting obviously occurs primarily in forested habitat, most of the effects on habitat heterogeneity and distribution will be related to shifting of old-growth forest to clear-cut, partial cut, and eventually to second growth forest. Some forest would also be converted to roads. There are, however, potential effects on other habitats resulting from roads, construction and operation of other facilities, and activities of timber harvest on adjacent non-federal lands.

No proposed roads would be constructed in areas mapped as muskeg, but there would be some road construction in mixed forest-muskeg habitat. Specifically, there would be 3.1, 3.6, 3.6, and 2.2 miles of road constructed in mixed forest-muskeg under alternatives 2, 3, 4, and 5, respectively. An unknown portion of this road mileage would pass through muskeg habitat. A minor amount of muskeg adjacent to forest land may be affected by harvest activities. No other habitat types are affected directly by roads or harvest activities.

Since there is to be no construction of a Log Transfer Facility (LTF), logging camp, or sorting yard, no impacts to habitat are expected from these types of facilities. The use of the Tonka LTF will likely affect a very limited amount of intertidal and offshore marine habitat along Wrangell Narrows.

Amount and Distribution of Old-Growth

Impacts to old-growth forest can be assessed using several different measures, including the total old-growth area harvested, the area of interior old-growth habitat remaining after harvest, and the increase in fragmentation of old-growth forest. These measures provide a perspective of the landscape effects of the South Lindenberg Timber Sale that complements the effects on specific species assessed through the use of Habitat Capability Models and other analyses discussed in the Chapter 4 Wildlife Section.

The amount of old-growth forest converted to clear-cut or partial-cut varies from 1,725 acres under Alternative 3 to 1,815 acres under Alternative 4 (Figure 3-15) and represents a temporary loss in available old-growth habitat. This loss of old-growth would continue as long as the harvested area is managed for timber production at less than a 150-year rotation.

Decrease in the area of interior old-growth would range from about 1,300 acres under Alternative 2 to about 1,800 acres under Alternative 3 (Figure 4-8). The loss of interior old-growth is particularly important to species that are obligate inhabitants of interior old-growth, which in Southeast Alaska tend to be neo-tropical migrant birds that are sensitive to the area of old-growth forest habitat (Sidle, 1985). One of the better documented reasons that some bird species prefer or require interior old-growth is the reduced rate of predation compared to edge habitats (Noss and Cooperrider, 1994). Protection from severe weather is another factor that makes interior forest habitat important to a variety of species in this region (Schoen et al., 1988).

Fragmentation is here defined as the breaking up of large blocks of contiguous forest into smaller blocks. Under conditions prior to any harvesting in the South Lindenberg area, six areas of contiguous old-growth greater than 1,000 acres were delineated. These six areas were designated as Blocks 1 through 6 (Figure 3-16). One of these areas (Block 6) in the southern portion of the Mitchell Creek drainage was broken up by previous harvesting into blocks less than 1000 acres in size. Harvesting of forest under any of the proposed four alternatives will not result in the shift of any blocks greater than 1000 acres in size to blocks less than 1000 acres. Furthermore, there is no substantial increase in the amount of forest in smaller block sizes under any of the alternatives (Figure 4-9).

The size of the five blocks greater than 1000 acres will decrease compared to existing conditions under all alternatives, with the decrease relatively similar among alternatives (Figure 4-10). Blocks 1 and 4 (located in the northern Duncan Creek and northern Mitchell Creek drainages, respectively) would have the greatest decrease in area from existing conditions. Block 1 would be reduced by a maximum of 14 percent of its existing area (Alternative 4), and Block 4 would be reduced by a maximum of 10 percent (Alternative 2).

Management Indicator Species

Since an analysis of impacts on every wildlife species is not possible, Management Indicator Species (MIS) can be used as representatives of the larger array of wildlife species occurring in a geographic area. Habitat Capability Modeling (HCM) of MIS provides a systematic method to compare the habitat-based impacts of the timber sale alternatives, although the results of such modeling need to be interpreted cautiously.

Habitat capability for 10 MIS (listed in Wildlife Section) was modeled for each action alternative and presented in the form of carrying capacity (i.e., the number of animals the South Lindenberg area may potentially support). For most species, habitat capability was modeled for both clear-cut and second growth conditions. The results of this analysis are presented in detail in the Wildlife Section. These results indicate that changes in habitat capability generally do not differ substantially among alternatives, although for most modeled species Alternative 3 had greater reductions in habitat capability than the other action alternatives.

These results suggest that loss of habitat alone from the South Lindenberg Timber Sale would not have a significant effect on most of these MIS species, with the exception of cavity nesting birds. However, these results do not address cumulative effects nor do they consider effects not incorporated into the models, including forest fragmentation and increased access.

Figure 4-8

Reduction of Total Old-Growth and Interior Old-Growth Forest in the South Lindenberg Area Under Each Action Alternative

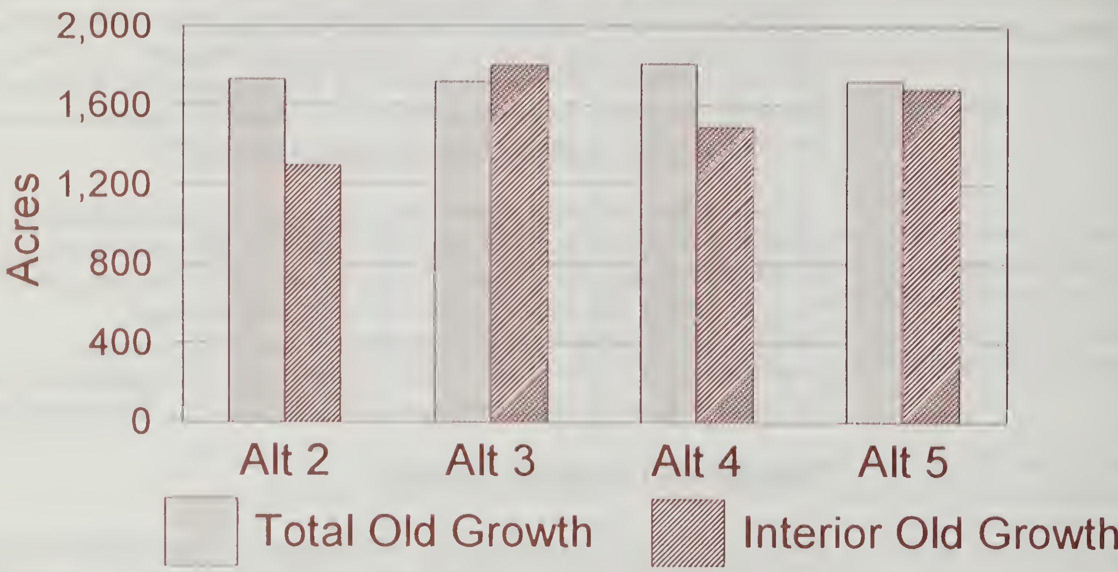
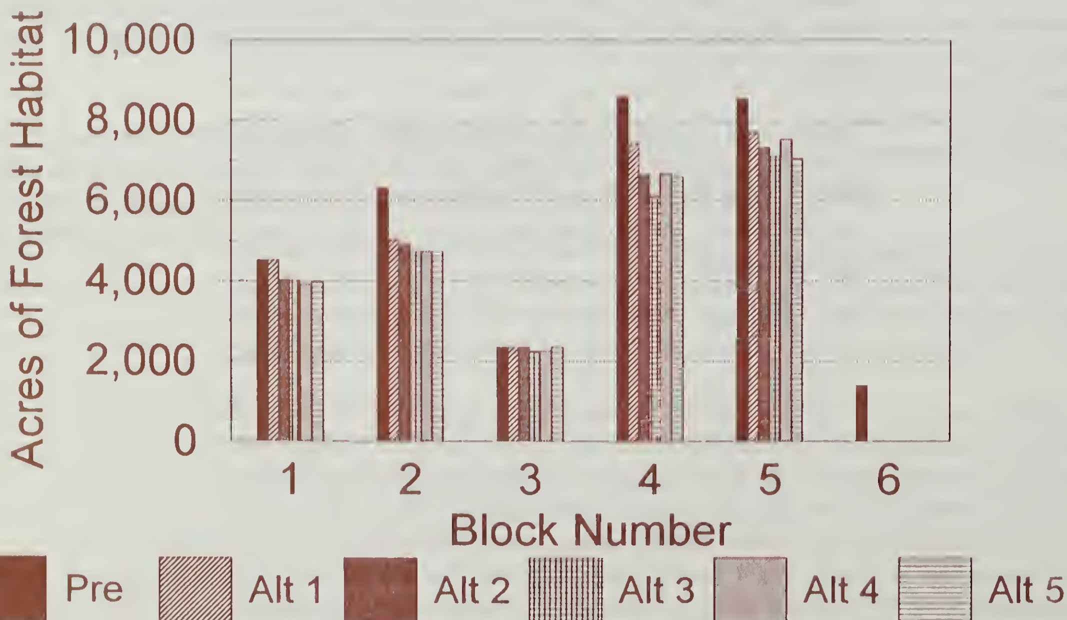


Figure 4-9

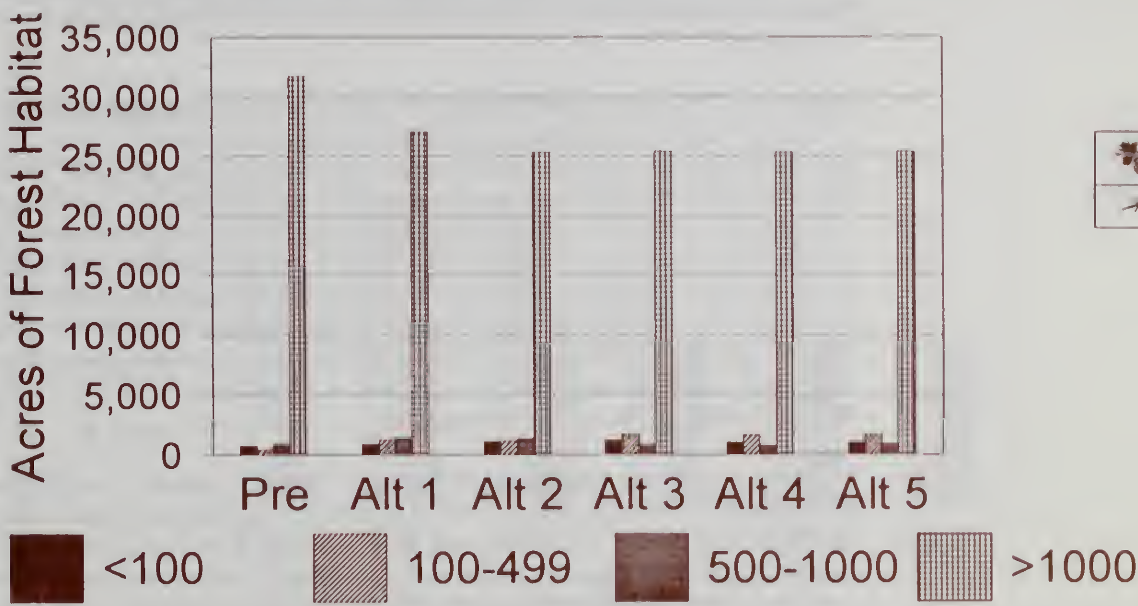
Acres of Forest Habitat in Four Block Size Classes (< 100 Acres, 100-499 Acres, 500-1000 Acres, and > 1000 Acres) Remaining Prior to Any Harvest, Under Existing Conditions, and Following Each of the Action Alternatives



Pre = Prior to any harvest; Alt 1 = existing conditions; Alt 2, 3, 4, 5 = Alternatives 2, 3, 4, and 5

Figure 4-10

Acres of Old-Growth Forest Remaining Prior to Any Harvest, Under Existing Conditions, and Following Each of the Action Alternatives



Pre = Prior to any harvest; Alt 1 = existing conditions; Alt 2, 3, 4, 5 = Alternatives 2, 3, 4, and 5

Many of these MIS species depend on large contiguous areas of forest that retain substantial amounts of interim old-growth (e.g., cavity nesting birds, marten, Sitka black tailed deer), however forest patch size is not a factor considered by the HCM. As described above, there would be no major decrease in the size of forest blocks from the South Lindenberg Timber Sale (maximum of 14 percent reduction in block area) and reduction in total interior old-growth forest would be less than eight percent. Thus, fragmentation of forest blocks and loss of interior old-growth due to the South Lindenberg Timber Sale would not appear to have a significant effect on MIS populations under any alternative. Cumulative effects of fragmentation, however, are important to consider and are addressed below. It should also be noted that sufficient corridors of unharvested forest would remain after the proposed harvest under each of the four action alternatives to allow movement of old-growth dependent MIS among remaining forested areas in the South Lindenberg area and between the South Lindenberg area and the Duncan Creek-Salt Chuck Wilderness to the north.

TES Species

The TES species of most concern in the South Lindenberg Timber Sale are marbled murrelet (former Federal Category 2), Queen Charlotte goshawk (former Federal Category 2, Forest Service Sensitive), Alexander Archipelago wolf (former Federal Category 2), and Choris' bog orchid (Forest Service Sensitive). Impacts to TES species are discussed in detail in that Section of Chapter 4, and the analysis here is focused on the importance of these species to biodiversity concerns.

TES species are considered an important biodiversity element because they are rare, or if they are not rare, because they are vulnerable to a loss of viability. Rare species often represent unique populations that are either at the edge of their distributional range, disjunct

from their normal range, or are endemic (native to a relatively small area). Rare species often occur in small numbers or in few locations and consequently can be quite vulnerable to impacts. Species that are presently relatively common may also be vulnerable to loss of viability, if there is a trend toward widespread loss of habitat (e.g., spotted owls in the Pacific Northwest) or decreased reproductive success (e.g., DDT effects on bald eagle). Loss of any species from an ecosystem or region is a significant reduction in natural biodiversity and may also indicate that other, less well known species are in danger of extirpation.

Impacts to TES species could be significant for marbled murrelet (former Federal Category 2) and Alexander Archipelago wolf (former Federal Category 2) due to the loss of old-growth habitat and increased road length. Alternatives 3 and 4 would likely have the greatest affect on one or both of these species due to the greater amount of proposed road construction and the harvest of old-growth in the Skogs Creek watershed, which was found to have high marbled murrelet activity. Known Queen Charlotte goshawk (former Federal Category 2, Forest Service Sensitive) nests would be affected to differing degrees depending on alternative. Both the Mitchell Creek and the Mountain Point goshawk nest areas would be most affected by Alternatives 3 and 4, which propose roads or harvest units in the vicinity of the nest areas. There would be some loss of Choris' bog orchid individuals (Forest Service Sensitive) due to road construction.

From the assessment summarized here and presented in detail in the Chapter 4 Section on TES species, it is likely that the South Lindenberg Timber Sale would have some impacts to all of the TES species known to occur in the area, no matter which alternative is selected. Impacts to marbled murrelet appear to be potentially the most substantial, but impacts from previous timber sales and the South Lindenberg Timber Sale are not likely to cause the extirpation of any TES species from the South Lindenberg area. Assessment of impacts to TES species (particularly those that have high mobility and large home ranges, such as the Queen Charlotte goshawk and Alexander Archipelago Wolf), however, are most meaningfully viewed from a landscape perspective, encompassing a much greater area than the South Lindenberg area alone. These impacts are addressed at the Forest Plan level and also in the cumulative effects sections of this document.

Fish Populations

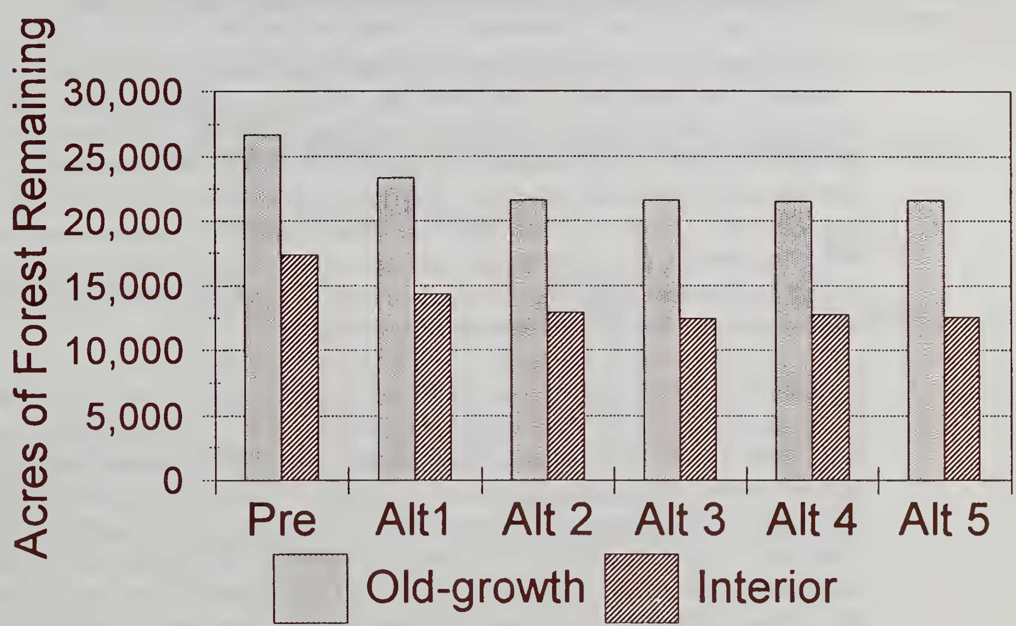
Potential impacts to fish populations from timber harvest and roads include increased sediment in streams, higher stream temperatures, barriers to fish passage, and increased fishing pressure. None of these impacts resulting from the South Lindenberg Timber Sale are expected to be significant, and mitigation measures should help to reduce impacts where they occur (Olson, 1995). Consequently, fish populations in the South Lindenberg area do not appear to be threatened by the proposed harvest and there is not expected to be any losses to this biodiversity element. In turn, other species that depend on fish, such as bald eagle or river otters, should not have a significantly reduced prey base.

Other Effects of Proposed Alternatives

The specific location of roads and harvest units affects local areas that are known or suspected of having relatively high importance to biodiversity. In the South Lindenberg area, the Skogs Creek watershed is currently roadless and has high value to a variety of wildlife species, including Queen Charlotte goshawk and marbled murrelet. Alternatives 3 and 4 propose roads and harvest units in this watershed, whereas alternatives 2 and 5 do not. Another area considered important to biodiversity is the proposed medium Wildlife Retention Area in the southern portion of the South Lindenberg area. Only Alternative 2 would result in harvest units or roads being constructed in this now roadless and unharvested area. Other areas considered to have high value to one or more wildlife species include the Duncan Creek watershed (deer winter range) and the area long the Wrangell Narrows south

Figure 4-11

Acres of Old-Growth Forest Remaining Prior to Any Harvest, Under Existing Conditions, and Following Each of the Action Alternatives



Pre=Prior to any harvest: Alt 1=existing conditions; Alt 2, 3, 4, 5=Alternatives 2, 3, 4, and 5

of the Tonka Log Transfer Facility (deer winter range and marbled murrelet). Proposed harvest in the Duncan Creek watershed would be highest for Alternative 4 (459 acres), intermediate for alternatives 3 and 5 (335 and 388 acres, respectively) and lowest for Alternative 2 (161 acres). Along the Wrangell Narrows, Alternative 4 proposes the least amount of harvest, while alternatives 3 and 5 propose the most (much of which is in partial-cut units).

Among the alternatives, Alternative 5 was intended to minimize impacts to biodiversity and includes a number of design features that specifically address important biodiversity elements, including:

- no harvest in the Skogs Creek watershed;
- avoidance of Mitchell Creek and Mountain Point goshawk nests;
- maximizing areas of Wildlife Retention Areas;
- minimizing road density;
- incorporating partial cuts to the extent possible;
- concentrating rather than dispersing harvest units; and
- avoiding areas potentially affecting high sensitive fish habitat.

Several of the design features are also present in the other alternatives. However, Alternative 5 combines the greatest number of these components and overall would provide the least impact to biodiversity compared to the other alternatives.

Cumulative Effects Analysis

Cumulative effects on biodiversity resulting from the South Lindenberg Timber Sale, as well as past and future timber harvests, can reasonably be considered on two spatial scales: (1) effects within the South Lindenberg area and (2) effects across Kupreanof Island. Effects within the South Lindenberg area can be assessed with more confidence than island-wide effects, since more information is available and impacts are more readily interpreted.

Cumulative Effects Within the South Lindenberg Area

As was pointed out earlier, the South Lindenberg area encompasses most of the southern Lindenberg Peninsula and consequently approximates a natural biogeographic unit. Within the approximately 58,000 acre analysis area, approximately 3,350 acres of forest have been harvested. Timber harvest in the area began in the 1930s with harvest of less than 30 acres of forest along the marine shoreline. Harvesting up to 1980 was fairly minor, totaling less than 220 acres. Most of the harvest in the South Lindenberg area occurred between 1980 and 1992 with the Tonka Mountain and Toncan timber sales, during which most of the road system now present in the area was built. A minor amount of timber (< 100 acres) was also harvested in the White Alice Salvage Sale during 1993.

The cumulative effects of these previous sales and the South Lindenberg Timber Sale on old-growth habitat are evident in Figures 4-9 through 4-11. The effects of the South Lindenberg Timber Sale on the amount of old-growth forest, interior old-growth forest, and fragmentation are generally less than the combined effects of previous harvest. However, the total effects of all past and the proposed South Lindenberg timber sale would be a 21 percent reduction in total old-growth forest, and a 20 percent reduction in forest occurring in contiguous blocks of 1000 acres or more for all alternatives. There would be a 25.2 to 28.1 percent reduction in interior old-growth habitat. The narrow ranges of effects in each of these three categories indicates that differences in alternatives are minimal with respect to total area of old-growth, interior old-growth, or extent of fragmentation.

Although cumulative effects of the conversion of old-growth habitat to clear cut and second growth on individual species are discussed in more detail in the Wildlife Section of Chapter 4, some conclusions can be made concerning general effects on species diversity. Effects of forest harvest on species diversity in Southeast Alaska are not well known, but research from Pacific Northwest forests can be applied cautiously to Southeast Alaska, since forests between the two regions have considerable overlap in species composition and forest structure. Several studies focusing on Pacific Northwest forests have suggested that the major effects of clearcutting on biodiversity stem from the fragmentation of forest habitat into smaller and more isolated patches and reductions in interior old-growth habitat and loss of old-growth structural features (e.g., Franklin and Forman, 1987; Hansen et al., 1991; Lehmkuhl and Ruggiero, 1991).

It is difficult to predict at what point reductions in old-growth area and increases in fragmentation will have a significant effect on wildlife populations and other biodiversity elements. However, reductions of 20 percent of old-growth forest in large blocks and 28 percent of interior old-growth forest suggest that cumulative effects within the Lindenberg Peninsula could be approaching significance with the proposed South Lindenberg Timber Sale. Franklin and Forman (1987) have hypothesized that losses of obligate interior old-growth species should be expected when 30 to 50 percent of the original forest is cut over.

Cumulative Effects on Kupreanof Island

Since populations and ecosystems within the South Lindenberg area are continuous within the larger geographical area of Kupreanof Island, cumulative effects from the proposed timber sale extend to an island-wide scale. Within the existing and proposed Forest Plan (USDA Forest Service, 1985-86; 1991b) much of Kupreanof Island is designated as LUD IV

(Timber Production), and increased harvesting of forests on the island is expected to occur over the next 50 years. Together with past and the currently planned sales on Kupreanof Island, this 50-year time frame represents a reasonable time scale to assess cumulative effects. However, future sales have only been planned for the next 10 years.

Most of the relatively limited harvest to date has been in the northern portion of the island and in scattered areas along the southern coast. Since 1981, several Forest Service timber sales have occurred on Kupreanof Island totaling about 280 MMBF (Table 4-27). An

Table 4-27
Forest Service Timber Sales on Kupreanof Island[1]

Current and Past Timber Sales

Area Sale Name	Roads Status	Volume (MMBF)	(acres)	(miles)
Hamilton Creek South	Completed 1981	31	--	--
Portage-12 Mile	Completed 1984	49	2,327	19.2
Todahl	Completed 1991	36	1,081	17.1
Toncan	Completed 1992	56	1,501	18.7
Tonka Mountain	Completed 1992	56	1,692	32
Missionary	Completed 1992	5	213	--
White Alice Salvage	Completed 1993	2	87	--
North Irish	Partially Completed	28	1,775	39
Combination	Completed 1994	10	590	3
Portage Bay Salvage	Completed 1994	6	147	--
Bohemia Mountain	Active	36	1,259	27
Subtotal		**279**		
Tentatively Planned Timber Sales				
Sale Name	**FY Planned**	**Estimated Volume (MMBF)**	**Area (acres)**	**Roads (miles)**
Shamrock[2]	Planned 1996	39	1,948	38.6
Alternatives to Clearcut	Planned 1997	5	--	--
South Lindenberg	Planned 1997	15	--	--
South Lindenberg II	Planned 1997	17	--	--
South Lindenberg III	Planned 1997	8	--	--
Scott Peak	Planned 1999	10	--	--
South Kupreanof	Planned 2001	15	--	--
South Kupreanof II	Planned 2002	10	--	--
Subtotal		**153**		
TOTAL		***432***		

[1] Does not include past harvests in coastal areas, small planned sales, possible salvage sales, or ongoing harvests on Native lands.
[2] Includes planned Clover Sale.

additional 153 MMBF are tentatively planned to be harvested in Forest Service timber sales over the next decade. In addition, cumulative harvest to 1994 on Native lands of Kupreanof Island total 14,374 acres. Data on the volume of timber harvested from Native lands are lacking, but this harvested area indicates that total volume harvested on Native lands on Kupreanof Island to 1994 is at least that of the Forest Service harvest, which was 10,000 to 11,000 acres.

The volume of timber that would be harvested from the South Lindenberg area would be an approximately 15 percent increase in harvested volume compared to previous harvest on Kupreanof Island (not including Native harvests and past harvests in coastal areas). Proposed harvest from the South Lindenberg area would comprise 10 percent of the total past and planned harvested volume on the island from Forest Service timber sales.

Cumulative impacts to biodiversity are most appropriately evaluated on a landscape basis

Depending on the extent and rate of harvest and the implementation of mitigation measures, tentatively planned harvests over a 50-year time frame could cumulatively result in substantial loss and fragmentation of old-growth forest over much of the island. Effects of the South Lindenberg sale would comprise only a small proportion of these long-term, island-wide effects, but the harvest would be representative of the many smaller scale actions that would contribute to landscape-level effects. The cumulative loss of old-growth habitat and fragmentation of forest habitat on a landscape scale are most significant when they are extensive and continuous, eliminating areas where suitable old-growth occurs in large enough blocks to support viable populations of old-growth dependent species. Areas with an LUD of Timber Production would likely be the most affected by these cumulative impacts. Although a Draft Forest Plan Revision has not been approved, much of Kupreanof Island, including about half of the South Lindenberg Peninsula, has an LUD of Timber Production under the Preferred Alternative of the Draft Forest Plan Revision (USDA Forest Service, 1991b). In addition, there are substantial lands where timber production is allowed consistent with the maintenance of other resources. However, as discussed in more detail below, the presence of large blocks of land in which little to no timber production is planned (e.g., Wilderness and Primitive Recreation) and the designation of a system of wildlife

retention areas could effectively mitigate some of the cumulative impacts to biodiversity of extensive timber harvest on Kupreanof Island.

Mitigative Measures

Since biodiversity is largely a landscape issue, mitigative actions specific for biodiversity must also be conducted on a landscape level. Furthermore, effects on biodiversity from timber harvesting are significant primarily when considered on a cumulative basis of several to many harvests in an ecological unit such as Kupreanof Island. Mitigative measures for biodiversity in the South Lindenberg area must thus be implemented within the larger context of long-term harvesting over the entire island.

Alternative Silviculture

Some silvicultural methods recently introduced in the Pacific Northwest can reduce negative impacts to old-growth aspects of biodiversity. Uneven-aged harvesting and green tree retention preserve some structural characteristics of old-growth forests important for wildlife species. Retention of snags and slash also maintain important structural features of old-growth. These methods are part of a program termed "New Forestry" that has been proposed as an alternative to forestry practices historically dominated by clear-cut harvesting methods (Drushka 1990; Franklin 1989; Gillis 1990; Hansen et al. 1991).

Uneven-aged harvesting is typically accomplished by conducting multiple harvest entries into a unit, with one-half to two acre size cuts for each entry. By mimicking the scale of blow-down disturbance, the long-term result is a forest that is heterogenous in age-structure and corresponding physical structure, similar to a natural old-growth forest. Although uneven-aged silviculture is approved for use in the South Lindenberg area, its use is not common in Southeast Alaska.

Green-tree retention is another form of partial cutting that allows some large, living trees to remain following harvest. Green-tree retention results in a mixture of tree sizes in the young second-growth forest, thereby preserving some of the habitat features important to old-growth dependent wildlife. The retention of snags and large woody debris also allows important structural features of old-growth forests to be present in second-growth forests, providing critical wildlife habitat features for species such as cavity nesting birds and marten.

Within the proposed unit pool, 9 units are prescribed for uneven-aged cutting. For alternatives 2, 3, 4, and 5, respectively, there would be 0, 8, 1, and 7 units with uneven-aged cutting. All of these would be helicopter logged in 1 1/2- to 2-acre patches, with approximately 15 to 20 percent of the total area of these units logged during the South Lindenberg Timber Sale. Additional entries would be scheduled at approximately 30-year intervals. Green tree and snag retention in 0.5 to 1.0 acre areas are prescribed for ½ to ⅔ of the units, and snag retention will be utilized where safe on all units. Typically, slash is retained in place (including large woody debris) after a clearcut in Southeast Alaska.

Partial cutting is proposed at a fairly small scale for the South Lindenberg sale due to economic constraints imposed by the costs of road construction. Alternatives 3 and 5 propose the most partial cutting (8 and 7 units, respectively). Green tree retention and snag retention have been proposed to the extent possible, but are constrained by safety concerns associated with cable logging.

Retention Areas and Corridors

Mitigative measures for biodiversity on a broader, landscape scale are also relevant to the South Lindenberg area. Although landscape scale issues are more effectively addressed at the Forest Plan level, which can then be implemented on a project-specific basis, the relative

newness of biodiversity as an issue means that policies are evolving rapidly and that management guidelines for biodiversity are in a state of flux. In particular, the report prepared by an interagency committee on *A Strategy for Maintaining Well-Distributed, Viable Populations of Wildlife Associated with Old-Growth Forests of Southeast Alaska* (Suring et al., 1992a), sometimes referred to as the "ViPop plan," has recommended the establishment of HCAs that provide sufficiently large reserves of old-growth forest to maintain viable populations of old-growth dependent species. A network of these HCAs within a mosaic of harvested and unharvested areas is expected to allow for movement among populations and a much higher likelihood of population viability.

In contrast, the Draft Forest Plan Revision (USDA Forest Service, 1991b) has attempted to balance losses of biodiversity with retention of large areas of relatively undisturbed land on a Forest-wide basis, using LUDs to allocate land for large-scale retention. The interagency committee suggests that this approach, however, may not be effective for mitigating loss of biodiversity. Many of the areas allocated to LUDs with primary uses other than timber production are non-forest land and are of insufficient size or unevenly distributed for preserving old-growth species viability in an island setting. As an alternative, the interagency committee recommends a more localized management of old-growth, where HCAs are designated to maintain connectivity among populations of major geographic units, such as islands, on the Tongass National Forest.

One large and one medium HCA in the vicinity of the South Lindenberg area are proposed in the ViPop plan. The large HCA is north of the area in the Duncan-Salt Chuck Wilderness Area, and the medium HCA is in the southern portion of the area. Most of this latter area was included in the delineation of one of several contiguous retention areas for the South Lindenberg Timber Sale. Criteria for medium HCAs include a total area of at least 10,000 acres with at least 5,000 acres of old-growth > 8 MBF/acre and 2,500 acres of old-growth > 20,000 MBF/acre, which are met by both the Duncan-Salt Chuck Wilderness Area and the delineated retention area in the southern portion of the South Lindenberg area. Three additional retention areas (refer to Figure 4-6) were delineated that meet criteria for small HCAs (at least 1,600 acres in total area with at least 800 acre of old-growth > 8 MBF/acre). Combined, these retention areas and the Wilderness Area to the north would provide a network of unharvested forest, with corridors of unharvested forest land linking them, meeting the objectives of the ViPop plan.

From the perspective of preventing local extinction of populations on Kupreanof Island, this system of retention areas and HCAs could be considered effective mitigation for maintaining the legally mandated level of biodiversity prescribed by the Forest Management Act of 1976. However, it should be acknowledged that impacts to biodiversity are still likely to occur, even with this and other mitigation measures such as alternative silviculture. A desired future condition resulting from the conversion of old-growth to managed stands inherently reduces and fragments the amount of old-growth habitat and can be expected to result in reduced populations of old-growth dependent populations. Such trade-offs are recognized in the Draft Forest Plan Revision in the allocation of LUDs across the Tongass National Forest, although mitigation measures such as those proposed for the South Lindenberg Timber Sale can minimize the negative impacts of extensive timber harvest on areas managed for Timber Production.

Monitoring

An appropriate monitoring plan for biodiversity in the South Lindenberg area would be over the temporal and spatial scales of cumulative effects. This would entail a minimum 50-year time frame over all of the southern Lindenberg Peninsula. A more preferable monitoring plan for biodiversity would cover the whole of Kupreanof Island. The plan would entail tracking harvested units in a GIS database layer that shows the extent of old-growth forest, interior old-growth forest, and contiguous blocks of forest land. In the South Lindenberg area this layer has already been developed as part of the existing conditions and in describing

the effects of the action alternatives. Such a database could be updated with subsequent harvests in the South Lindenberg area and linked to an island-wide database to develop a tracking system of old-growth habitat. If future proposed harvests are projected to result in a sharper decrease in the amount of interior old-growth, for example, a potential threshold in the decline of biodiversity may be approached. The application of Habitat Capability Models when compared over multiple harvests would likely also reveal trends that indicate whether or not a threshold in biodiversity is being reached with continued habitat conversion. This is essentially the monitoring approach specified in the existing Forest Plan and the Draft Forest Plan Revision. More direct monitoring efforts of biodiversity would include assessments of specific species, however no island-wide monitoring programs of wildlife or old-growth MIS are presently in place.

Subsistence

Subsistence gathering is an important source of food for a majority of households in Southeast Alaska, reflecting many deeply-held traditional and cultural values for both Native and non-Native households. Nearly a third of rural households in Southeast Alaska obtain at least half their meat and fish by hunting and fishing (Holleman and Kruse, 1991). Examples of major subsistence resources include deer, salmon, halibut, trout, shellfish, and berries.

The first resource evaluated is deer. The discussion of the impacts on deer is followed by discussions of impacts on bear, furbearers, fish, shellfish, marine mammals, and other foods. Separate sections discuss the abundance of, access to, and competition for those resources.

Abundance and Distribution of Deer

Deer are one of the most important subsistence resources for communities in Southeast Alaska (ADF&G, 1989; Kruse and Muth, 1990). Subsistence use of deer is a particularly important issue in the South Lindenberg study area due to the precipitous decline of the Sitka black-tailed deer population in the early 1970s and the recent reopening of deer hunting season on Kupreanof Island (ADF&G, 1991a; USFWS, 1991).

This evaluation of deer for the South Lindenberg EIS is based on a comparison of supply and demand. The habitat capability model for deer, developed as part of the Draft Forest Plan Revision and applied in the Wildlife section of this EIS, provides an estimate of the potential number of deer available for harvest within the project area over time. This equates to a supply available for subsistence use. The potential amount available for subsistence use can be compared with historical harvest data, or demand, for deer. If the demand for deer exceeds the supply, then a significant possibility of a restriction exists. The ADF&G assumes that approximately ten percent of the deer population can be harvested safely if the population is equal to the habitat capability (ADF&G 1991a, 1992b). Thus, the minimum number of deer needed in an area is approximately ten times the subsistence hunter demand for deer, otherwise a restriction on subsistence hunting may ensue. The current hunting season, combined with the previous 20-year moratorium on Kupreanof deer harvest, constitute a restriction of subsistence use on the Lindenberg Peninsula.

It is assumed that communities that have historically used the study area for subsistence resources will continue do so in the foreseeable future, if the area remains open for deer hunting. Residents of Petersburg and Wrangell have historically used the Lindenberg Peninsula for deer hunting, with minimal activity by residents from Point Baker, Port Protection, and Kake (ADF&G, 1992a; Kruse and Frazier, 1988). The 1993 permit hunt data collected by the ADF&G indicates that of the 51 hunters that hunted on the Lindenberg Peninsula in 1993, 46 were from Petersburg, one was from Ketchikan, and four were from out of state (ADF&G, 1994). Twenty six of those hunters were successful in taking bucks from the Lindenberg Peninsula. The 1994 hunt data indicate somewhat higher success rates (Table 4-28).

The ADF&G has estimated that most of the historic hunter demand in WAA 5138 was from Petersburg and Wrangell (Table 4-28). Additional demand was from residents of Ketchikan and Juneau, which are not now considered subsistence communities. Following the standard methods of the ADF&G and the Forest Service (Paul, 1993; Doerr, 1993; USDA Forest Service, 1992a), it is assumed for this analysis that these deer harvest numbers represented 100 percent of the hunter demand in the 1960s for deer within the South Lindenberg study area. Because the deer season was closed on Kupreanof Island between 1975 and 1993, very few recent harvest figures are available for comparison.

When the historic hunter demand figures are increased at the same growth rate as the census figures for the same period, a relationship between the local population and the subsistence demand for deer can be estimated. The deer population necessary to support current subsistence needs is then calculated as 10 times the hunter demand (ADF&G, 1992b). This estimate of hunter demand can be compared to the habitat capability models for deer, and an indication given of whether or not the deer supply can meet demand.

Table 4-28
Annual Deer Harvest for Wildlife Analysis Area 5138, Lindenberg Peninsula

Community	1960s Estimate[1] Deer Killed	1993 Permit Hunt[2] No. Hunters	Deer Killed	1994 Permit Hunt[3] No. Hunters	Deer Killed
Petersburg	80	46	25	72	46
Ketchikan	44	1	0	2	1
Juneau	21	0	0	0	0
Wrangell	5	0	0	0	0
Outside AK	-	4	1	1	1

[1]Paul 1993. Memorandum, with addenda on estimated historical Game Management Unit 3 Deer Kill by Community.
[2]ADF&G 1994. 1993 Permit hunt data for WAA 5138.
[3]ADF&G 1995. Permit hunt data from Lindenberg Peninsula, Fall 1994.

Deer population estimates are based on habitat models. Habitat suitability index (HSI) models were constructed by the USDA Forest Service for several species throughout the Tongass National Forest in the revision to the Tongass Land Management Plan (USDA Forest Service, 1991d, Appendix L). The Draft Forest Plan Revision model estimated that 92 percent of the Sitka black-tailed deer habitat that existed in Wildlife Analysis Area (WAA) 5138 in 1954 still exists. (WAA #5138 encompasses all of the South Lindenberg study area and some adjacent state lands.) HSI models were also run specifically for the South Lindenberg Timber Sale EIS. The South Lindenberg analysis predicts that carrying capacity in WAA 5138 will decline by 3.3 to 5.3 percent, depending on the timing after harvest and the alternative chosen. Under the four action alternatives, Alternative 4 would have the least impact on deer habitat, followed by alternatives 2, 5, and 3 (in order of increasing impact). Under each alternative the habitat capability decreases initially due to timber harvest and the loss of old-growth shelter, and decreases further after approximately 25 years when the forest canopy begins to shade out species that provide winter browse (Alaback, 1982). The South Lindenberg HSI changes are diagramed in Figure 4-12 in which all the alternatives were combined due to their similar outcomes. A thorough discussion of the HSI model can be found in the Wildlife section.

Figure 4-12 graphically depicts the habitat capability for deer and the hunter demand for those deer. The graph shows the minimum deer population needed to meet subsistence and sport hunting demand (vertical bars), the habitat capability forecast by the Draft Forest Plan Revision database (long horizontal line), and the habitat capability forecast for the South

Lindenberg Timber Sale EIS (short horizontal line). The open diamond denotes the minimum deer needed to meet the recent (1993 and 1994) levels of deer harvest. As can be seen from Figure 4-12 the habitat capability approximately equaled the total estimated hunter demand in the 1970s, and the subsistence hunter demand is predicted to exceed the habitat capability sometime in the 1990s. The graph also indicates that since the 1970s, hunter demand has exceeded and will likely continue to exceed the supply of deer, primarily because of human population growth and not deer population decline. Table 4-28 and Figure 4-12 also indicate that the actual 1993 and 1994 hunter participation is significantly lower than what was predicted in the graph by extrapolating historical demand to the present. The 1993 and 1994 Petersburg hunter demand is from permit hunt statistics collected annually by ADF&G (ADF&G, 1994; ADF&G, 1995). The deer habitat capability modeled explicitly for the South Lindenberg EIS is somewhat lower than the estimate for the TLMP revision. Figure 4-12 also indicates that the South Lindenberg timber sale is expected to have a slight effect on the general downward trend of deer habitat capability.

Other factors have unpredictable effects on the supply and demand of deer in the study area. It is likely that the permit season for bucks will remain open on the Lindenberg Peninsula as long as the availability of male deer is not considered by ADF&G to be a limiting factor for the population (Land, 1993). Scoping comments for the South Lindenberg EIS and subsistence testimony from Petersburg and Kake (Grantham, 1993; Dalrymple, 1995; USDA Forest Service, 1993c) indicate that most local deer hunters shifted to the mainland or nearby islands when the deer season was closed on Kupreanof Island, but these hunters and would prefer to shift back to Kupreanof, if the deer population there rebounds.

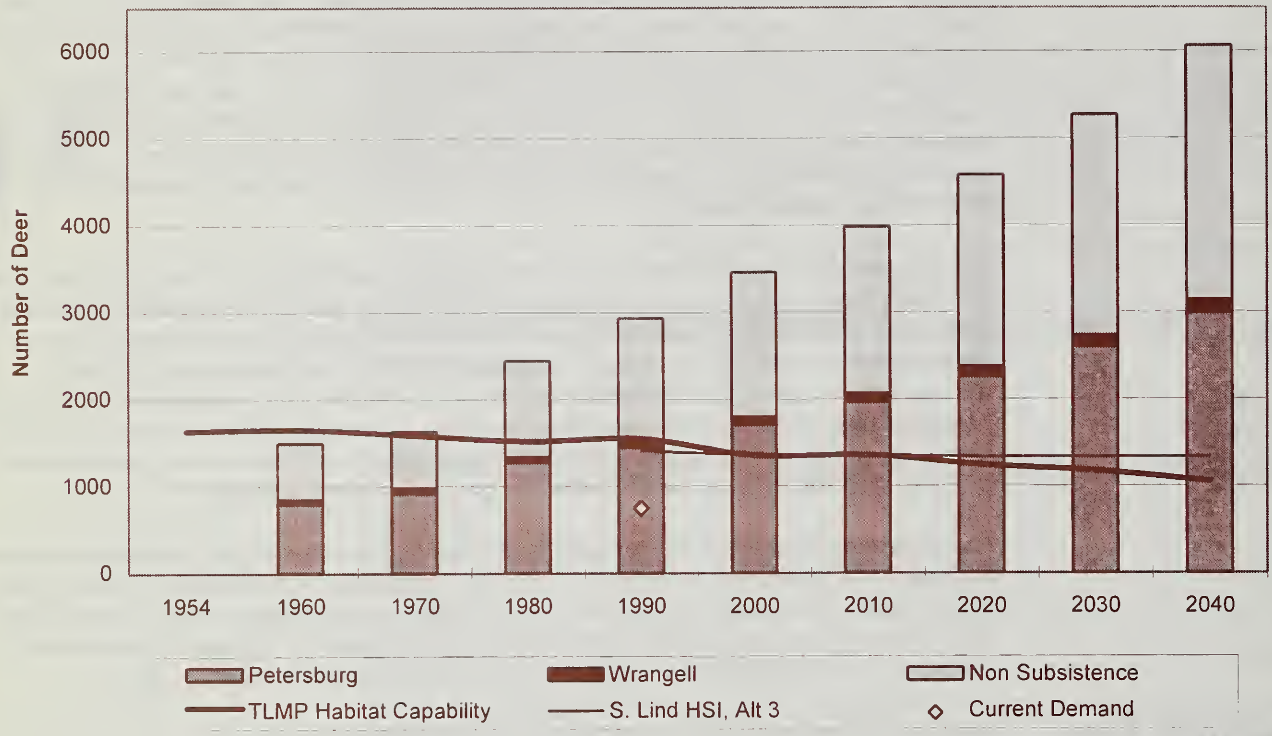
Based on the habitat capability modeling cited above, the unstable deer population reported on Kupreanof Island, and the levels of subsistence deer harvest and hunter demand reported by ADF&G, this evaluation concludes that a significant restriction on the subsistence use of deer will continue under all action alternatives. This possibility of a restriction currently exists and is due primarily to the high hunter demand for deer in the study area.

Abundance and Distribution of Black Bear

Kupreanof Island is a popular area for black bear hunting. Black bear harvest has increased since 1981, especially by nonresident (out of state) hunters. On a region-wide scale approximately three percent of households in the Kupreanof Island area harvest black bear (Kruse and Frazier, 1988). Of the nearby communities, Point Baker is the most active in bear hunting; approximately 21 percent of Point Baker households harvested bear in 1987, some of which may have been from the Lindenberg Peninsula. Five percent of Wrangell households hunted bear in 1987. Of the 28 black bears taken by Wrangell households in 1987, six were from the Kupreanof Island area; the others were from the Stikine River drainage (Cohen, 1989). Three percent of Petersburg households hunted bear in 1987 (Kruse and Frazier, 1988).

Timber-related impacts on black bear habitat capability are not expected to significantly affect the study area population. Projected changes indicate the carrying capacity for bear to decline by 0.1 to 3.9 percent, depending on the alternative chosen (Percival et al., 1996). The habitat capability model, as well as direct evidence during the data gathering for this EIS, indicates that there is a healthy and abundant black bear population on Kupreanof Island.

Figure 4-12
Habitat Capability and Estimated Hunter Demand for Deer; South Lindenberg Peninsula, WAA 5138



Notes:

(1) Petersburg, Wrangell, and non-subsistence hunter demand is based on ADF&G (1992b) and Paul (1994), by methods of Doerr (1993), as explained in the text. Non-subsistence communities are Juneau and Ketchikan. The number of deer necessary to meet hunter demand is assumed to be 10 times the expected deer kill, according to ADF&G (1991a).

(2) Census data are from U.S. Department of Commerce (1990). Revised Draft Forest Plan revision assumes 18 percent population growth for 1990-2010, and 15 percent growth from 2010-2040.

(3) Draft Forest Plan Revision Habitat Capability is based on USDA Forest Service (1991d), Appendix L.

(4) South Lindenberg HSI, Alternative 3, represents the highest-impact scenario among alternatives. Individual alternatives were not sufficiently different to appear as individual lines on the graph.

(5) Current Harvest is from ADF&G (1994) and ADF&G (1995). Open diamond represents deer needed to meet current hunter demand (see footnote 1, above).

Based on the habitat capability modeling cited above, the healthy bear population reported on Kupreanof, and the levels of subsistence bear harvest reported by the TRUCS reports, there is not expected to be a significant restriction on the subsistence use of bear under any action alternative.

Abundance and Distribution of Furbearers

According to reports by the ADF&G (Smythe, 1988; Cohen, 1989), some trapping by Petersburg residents occurs along the beach fringe on Kupreanof Island. Few of the study communities harvest large quantities of furbearers. Seven percent of Petersburg households harvest furbearers (Kruse and Frazier, 1988), and less than one percent of Wrangell households successfully trapped furbearers in 1986-1987 (Cohen, 1989).

Marten were chosen as a management indicator species (MIS) for the South Lindenberg analysis area. The estimated marten habitat capability within the study area in 1954 was set at 101 animals. The estimated habitat capability in 1990 totals 93 animals (USDA Forest Service 1991d, Appendix L). The estimated reduction of marten habitat capability due to the South Lindenberg Timber Sale, discussed in the Wildlife section, is between 4.7 and 6.4 percent overall, depending on which alternative is chosen. Significant subsistence restrictions on marten are not expected as a result of any action alternative for the South Lindenberg Timber Sale. However, some evidence suggests that roading the Lindenberg Peninsula interior could cause a drop in marten population due to trapping pressure. A thorough discussion on impacts to marten can be found in the Wildlife section of Chapter 4.

Abundance and Distribution of Moose

Moose are relative newcomers to Kupreanof Island and have only recently grown to a population that can support hunting by humans (ADF&G, 1991b). Because moose were not hunted on Kupreanof Island by indigenous Alaskans, or even by early settlers, moose are not considered a subsistence species (Land, 1993). It should also be noted that the moose hunt is designed to allow taking of individuals that will not limit or jeopardize the growth of the moose herd on Kupreanof Island.

Based on the expanding moose population and evidence that clearcutting is beneficial to moose habitat in the short term, no significant restriction to subsistence hunting for moose is expected to result from any action alternative of the South Lindenberg timber sale.

Access to Deer and Other Wildlife

Traditionally, local subsistence users have harvested wildlife in conjunction with other hunting and gathering activities, and hunting access was primarily via foot and boat. This mode of access is not expected to be restricted by any of the action alternatives for the South Lindenberg Timber Sale. Access to interior hunting areas is expected to increase significantly as a result of road building. Access to areas along the beach fringe will not change.

The study area is not accessible via the Alaska Marine Highway; all vehicles using the area roads must be ferried to the Tonka LTF on private boats. Several hunters off-loaded all terrain vehicles (ATVs) at the Tonka LTF during the 1993 hunting season to use on the existing logging roads (Hyatt, 1994). It is expected that no logging camps will be required for harvesting timber in the study area, due to the close proximity of Petersburg for housing timber workers.

The current road system allows for extensive access to the interior of the Lindenberg Peninsula, primarily on Forest Service roads 6350, 6352, 6354, and 6355. All of the action alternatives would increase access by extending roads along the slope north of Duncan Creek (road 43500 and associated spurs) and into the upper tributaries of Mitchell Creek (Road 43527). Alternatives 3 and 4 would build a road into the uppermost drainage of Skogs Creek (Road 43520). Alternatives 2, 3, and 5 would extend Road 6355 south past Green Rocks Lake. Alternative 2 would extend this road an additional 1.5 miles further south.

Additional roading will increase access to deer hunting on the Lindenberg Peninsula, and as such will not restrict subsistence use of deer in the area.

Competition for Deer and Other Wildlife

Competition for deer and other wildlife could be affected in three ways. First, increased road access could attract more hunters to the Lindenberg study area, although the new roads would probably not represent a significantly increased enticement to new hunters over the existing roads. Second, hunters who traditionally use the Lindenberg peninsula might choose to hunt in different areas that are opened up by new logging roads, such as those proposed into the headwaters of Skogs Creek or the southern tip of the peninsula. This could affect local residents who have traditionally accessed these areas by foot. Third, timber workers who become familiar with the Lindenberg Peninsula through their employment may elect to return there during hunting season and may hold a competitive hunting advantage by doing so.

Competition is closely linked to access, and both can be interpreted as being either favorable or adverse to subsistence gathering. On one hand, opening an area up by increasing access is a favorable development for most subsistence users. On the other hand, that same increased access represents increased competition for subsistence resources, which is interpreted as an adverse impact. Increased access can be considered favorable for subsistence users, but can also be an adverse impact to the resource itself if the resource is strained by additional harvesting, which in the long run is an adverse impact for the users as well.

Due to the possible consequences of increased competition, the increased roading for the South Lindenberg timber sale is expected to exacerbate the current restriction on the subsistence use of deer in the study area.

The Lindenberg Peninsula provides a variety of subsistence resources in close proximity to Petersburg

Fish and Shellfish Effects and Evaluation

Fish and shellfish comprise a very significant portion of the diet of most residents in Southeast Alaska. The subsistence discussion in Chapter 3 indicates that over 60 percent of the subsistence resources gathered by Petersburg residents are fish and shellfish; the comparable figure for Wrangell is almost 70 percent. The TRUCS-based maps in Appendix C show that many of the favored fishing areas for these two communities is either on or around the Lindenberg Peninsula.

Abundance and Distribution of Fish and Shellfish

Limited information is available on the distribution and abundance of salmon, trout, and other finfish in the study area. The information that is available, such as escapement counts for individual streams, has been analyzed in the Fisheries section. Stream productivity would be reduced in both the short and long term by all of the action alternatives, although the Fisheries Resource Report concludes that Alternative 5 would present the fewest impacts to streams and fish, Alternative 3 would present the most. The overall reduction of fish populations due to timber harvest would be minimized because of TTRA stream buffers, road construction BMPs, and other protective measures. The impacts to fish populations would decrease in years following harvest, because short-term timber harvest activities (road construction and timber harvesting) have the greatest impact on the fishery resource. Long-term timber harvest impacts are relatively small, if roads are maintained and disturbed areas revegetate.

The effects of timber harvest and road construction on shellfish populations is expected to be low for all action alternatives. The Tonka LTF would present the greatest potential for adverse impacts to shellfish. Accumulations of bark, wood debris, and wastes from the Tonka LTF was recognized as a problem during previous harvests.

Access to Fish and Shellfish

Roading associated with the South Lindenberg Timber Sale will increase access to streams but not shorelines in the study area. Road 43500 will facilitate access to the upper reaches of Duncan Creek, which contain trout but are not accessible to anadromous fish because of a fish passage barrier downstream. Because timber will be harvested on uplands and away from shorelines, access to historic saltwater fish and shellfish areas should not be affected in the near or foreseeable future by the proposed timber harvest.

Competition for Fish and Shellfish

Due to the remote location of the Lindenberg Peninsula and the numerous other opportunities in the area, competition for fish is not expected to increase due to the South Lindenberg Timber Sale. Fishing and shellfish gathering occurs primarily from boats and on beaches, negating any access impacts due to timber harvests or road building.

Some logging company employees may meet residency requirements and qualify as subsistence users. This, however, is not expected to be a substantial increase in resource use, due to the small number of people involved and the number of timber workers that are likely to come from the local area.

Other Plants and Foods Effects and Evaluation

Other items used for subsistence include plants such as kelp, wood, and a variety of berries. Though other foods did not constitute a major portion of the 1987 subsistence harvest by the rural communities documented in TRUCS, they are considered subsistence resources. TRUCS data indicate that other foods and plants make up 3.6 and 1.9 percent of the per capita harvest of the household subsistence harvests in Petersburg and Wrangell, respectively.

Most traditional gathering of other plants and foods occurs near beach and estuarine areas. Areas open for firewood gathering are controlled by the Forest Service. Clearcutting associated with the proposed timber harvest activity would probably improve the abundance of berries in the short term, because many of these plant species thrive on the open exposed slopes created by clearcuts (Alaback, 1982). Based on a projected increase of berries and the locations of the potential activities, short term and reasonably foreseeable effects of the proposed action alternative on abundance and distribution would be minimal, if not favorable.

Marine Mammals Effects and Evaluation

The Marine Mammal Protection Act (1972) prohibits the taking of marine mammals by anyone other than Alaska Natives. The Act allows Alaska Natives to take marine mammals, so long as it is used for a "subsistence purpose," or to create "authentic native" handicrafts or clothing and "is not accomplished in a wasteful manner."

The most likely area for any hunting of marine mammals is in Duncan Canal. Duncan Canal is a documented area for seal hunting by Native households in Wrangell (Cohen, 1989). Currently, there is no evidence to suggest that timber harvest and related development activities have any impact on marine mammals. Therefore, no significant restriction to the subsistence use of marine mammals is expected under any alternative for the South Lindenberg timber sale.

Cumulative Effects

The subsistence analysis evaluates whether the project, in combination with other past, present, and reasonably foreseeable future actions, may significantly restrict subsistence uses. Although the precise location of future projects is not clearly known, some conclusions can be reasonably made about future impacts.

Action on other lands surrounding the analysis area may affect subsistence resources harvested by local residents. Examples include the private holdings and State of Alaska timber lands on the Lindenberg Peninsula along Wrangell Narrows. There is the potential for development of these lands to have long-term implications for subsistence users. Deer and marten populations could be significantly impacted by actions on these lands as well as Forest Service lands. However, given the types of impacts normally associated with timber harvest, subsistence use of black bear, waterfowl, salmon, other finfish, and other food resources in the project area are not expected to be significantly restricted by these future activities.

The cumulative effects on fish habitat are primarily associated with past logging. It is anticipated that application of BMPs and stream side buffers will minimize future impacts to fish habitat. The Watershed Resource Report for the South Lindenberg EIS (Gagner, 1996) discusses the threshold levels of concern for the watersheds in the project area which indirectly affect fish habitat.

The Forest Service is in the process of revising the Tongass Land Management Plan (TLMP), or Forest Plan, through the NEPA process. Potential effects to subsistence users are being addressed during the revision. To assure consistency between this EIS and the Forest Plan, many of the statistics on wildlife habitat and future vegetation changes in this report were taken from the Draft Forest Plan Revision DEIS (USDA Forest Service, 1991d). Future subsistence resources could be affected by changes in planned land uses resulting from the ongoing Draft Forest Plan Revision.

All of the alternatives considered in the revision of the Forest Plan, if all permissible projects in the Tongass were fully implemented, have the potential to impact subsistence uses of deer, brown bear, and furbearers, specifically marten, due to potential effects of projects on abundance and distribution and competition (USDA Forest Service, 1991a). Due to the uncertainties associated with projecting impacts of proposed forest-wide projects fifty years into the future, it is difficult to say whether these impacts would rise to the level that may significantly restrict subsistence uses of these resources.

The Federal Subsistence Board has the authority to regulate subsistence and non-subsistence use of resources in the Tongass National Forest when those resources are approaching scarcity. This type of action, as prescribed by ANILCA Section 804, could be used to ensure the availability of adequate subsistence resources needed by the rural communities using Kupreanof Island.

ANILCA Compliance

The actions proposed in this document have been examined to determine whether they are in compliance with the Alaska National Interest Lands Conservation Act (ANILCA) Section 810. Standards used for the review include (1) the National Forest Management Act of 1976 and its implementing regulations; (2) the Alaska National Interest Lands Conservation Act (1980); (3) the Alaska Regional Guide (1983); (4) the Tongass Land Management Plan and Draft Revision; (5) the Tongass Timber Reform Act (1990); (6) the Alaska State Forest Practices Act; (7) the Alaska Coastal Management Program; (8) Multiple Use Sustained Yield Act (1960); (9) USDA Forest Service Subsistence Management and Use Handbook (FSH 2609.25).

Necessary and Consistent with Sound Management of Public Lands

The ANILCA placed an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make available for harvest 4.5 billion board feet of timber per decade from the Tongass National Forest. The Forest Plan makes the determination of which uses are suitable for various parcels of land within the Tongass National Forest. The current Forest Plan has determined that the study area should be managed for varying levels of timber production. The Forest Plan is currently undergoing revision, but the alternatives being considered in the most recently published revision also recommend that the Lindenberg Peninsula be devoted mainly to timber production (USDA Forest Service, 1991a).

The alternatives presented here encompass four action alternatives that would help achieve multiple use management objectives in the Forest Plan. All of the action alternatives involve some potential impact to subsistence uses. Based entirely on the guidance provided by the documents listed above, these actions are considered necessary and consistent with sound management of public lands.

Amount of Land Necessary to Accomplish the Purpose of the Proposed Action

Much of the Tongass National Forest is used by one or more rural communities for subsistence purposes. It is not possible to lessen harvest in one area and concentrate it in another without impacting one or more rural communities' important subsistence use areas. In addition, harvestable populations of game species could not be maintained in a natural distribution across the forest if timber harvest were concentrated in specific areas.

The Lindenberg Peninsula south of the Petersburg Creek - Duncan Salt Chuck Wilderness is approximately 66,000 acres. The State and private lands within this area encompass approximately 8,500 acres. The entire pool of harvest units (no alternative proposes to cut all of the harvest units) totals 2,937 acres. Alternatives 2, 3, and 5 would each harvest approximately 1,730 acres, while Alternative 4 would harvest 1,815 acres. The Lands Resource Report (Hyatt, 1995) contains specific information on the land ownership and acreages involved.

The extent and location of the subsistence use areas on the Lindenberg Peninsula prevents their being avoided completely. However, the large areas of critical deer habitat and the documented deer hunting areas were avoided to the extent feasible, particularly in Alternatives 4 and 5.

Reasonable Steps to Minimize Adverse Impacts Upon Subsistence Uses and Resources

Chapter 2 describes the standards, guidelines and mitigation measures that will be implemented as part of the selected alternative. Most of the standards, guidelines and

mitigation measures are designed to maintain fish and wildlife habitat productivity at as high a level as possible, while still harvesting timber to meet the purpose and need of the project.

One of the most significant subsistence resources in the analysis area is salmon. Fish habitat is protected in each alternative through the application of the Forest Service guidelines, BMPs, and TTRA stream buffers. In addition to protecting fish habitat these buffers also protect estuarine and riparian habitat important to other species such as deer, black bear, and furbearers.

All of the action alternatives have incorporated the Draft Forest Plan Revision standards and guidelines (USDA Forest Service, 1991a). In addition, design criteria for Alternative 4 located roads and units outside of important subsistence use areas such as riparian corridors, exceptional deer winter habitat, and documented deer hunting areas. This has resulted in protection of the areas of highest value to subsistence users.

As previously mentioned, one measure to mitigate the impacts of road building on subsistence users would be to restrict the use of logging roads, especially during hunting season. This measure would have the effect of making access to the post-harvest study area as similar as possible to that of the pre-harvest study area. Although the building of roads can assist subsistence hunters by making new areas accessible, the increased competition from other hunters and the increased pressure on the deer population could outweigh the advantages of easier access.

To achieve the road closure, vehicle passage barriers (so-called “tank traps”) could be dug across the roads to inhibit motorized access. Critical culverts could be removed to impede travel and reduce road maintenance problems that contribute sediment to streams. Signs could be posted to inform hunters of the need for road closure, otherwise ATVs would be used to bypass the impediments. Other possible measures might include prohibitions of off-loading vehicles at the Tonka LTF, or prohibitions on non-Forest Service vehicle use on Forest Service roads, especially during hunting season. As discussed in the Chapter 4 Wildlife section, however, the effectiveness of closing roads using these methods is questionable.

Conclusions and Findings

The potential foreseeable effects from the action alternatives in this project are not expected to result in a significant restriction of subsistence uses of black bear, furbearers, marine mammals, waterfowl, salmon, other finfish, or other foods.

The limited deer season on the Lindenberg Peninsula already constitutes a significant restriction on the subsistence use of deer. Vegetation and habitat changes resulting from the South Lindenberg timber sale are not expected to have substantial impacts on the abundance of deer, but will incrementally affect subsistence use of deer in WAA 5138. Changes in access and competition are likewise not sufficient to result in a significant restriction of subsistence use of deer, but could contribute to the decline of the population and the availability of deer for subsistence use.

This EIS finding concludes that the South Lindenberg timber sale will exacerbate the current restriction of subsistence use of deer in WAA 5138, regardless of the action alternative chosen. This result could ensue from a decreased abundance of deer and the competition that comes from increased access to hunting areas. The restrictions on subsistence resources, and the probable causes of further restrictions, are summarized in Table 4-29 below.

Table 4-29
Summary of Current Restrictions on Subsistence Resources or Possible Restrictions Due to South Lindenberg Timber Sale

Resource	Abundance & Distribution	Access	Competition
Deer	current	no	possible
Marten	no	no	possible
Other Wildlife	no	no	no
Fish	no	no	no
Shellfish	no	no	no
Other Foods	no	no	no

Recreation

The introduction of additional roads, harvest units, and rockpits into the landscape of the South Lindenberg study area would alter the recreation setting (including attributes such as remoteness and the evidence of human activity) and cause a shift toward the development end of the recreation opportunity spectrum. (See the Chapter 3 for a discussion of the Recreational Opportunity Spectrum [ROS]). Some opportunities for semi-primitive non-motorized and semi-primitive motorized recreation would be foregone, while other recreation, particularly those for road-dependent recreation, would increase. Timber harvest activities would expand the existing road system in the study area, which would increase roaded access (depending on alternative) in the Duncan Creek, Colorado Creek, and Skogs Creek drainages. Higher concentrations of people would be expected in roaded areas, compared to unroaded areas, and since all methods of access and travel may occur within roaded areas, sights and sounds of people would most likely increase.

Direct Effects

Direct effects resulting from the proposed action include changes in access to the study area for recreational opportunities on the Lindenberg Peninsula. These changes would bring about increased opportunities for recreation associated with roads and decreased opportunities for semi-primitive forms of recreation.

Access

With the exception of Alternative 1 (no action), all of the alternatives include road construction (refer to Chapter 2 for maps and tables of road additions by alternative). New developed and temporary roads added to the existing road system would provide additional public access into the South Lindenberg area. Such access would facilitate recreational uses, including mountain biking, off road vehicle (ORV) use, hiking, sport fishing, and hunting. Access to traditional subsistence deer hunting areas would increase, which may increase competition from hunters, leading to decreased opportunities for harvest. In addition, new hunting areas will become accessible, and hunting will occur where it was previously very light to non-existent.

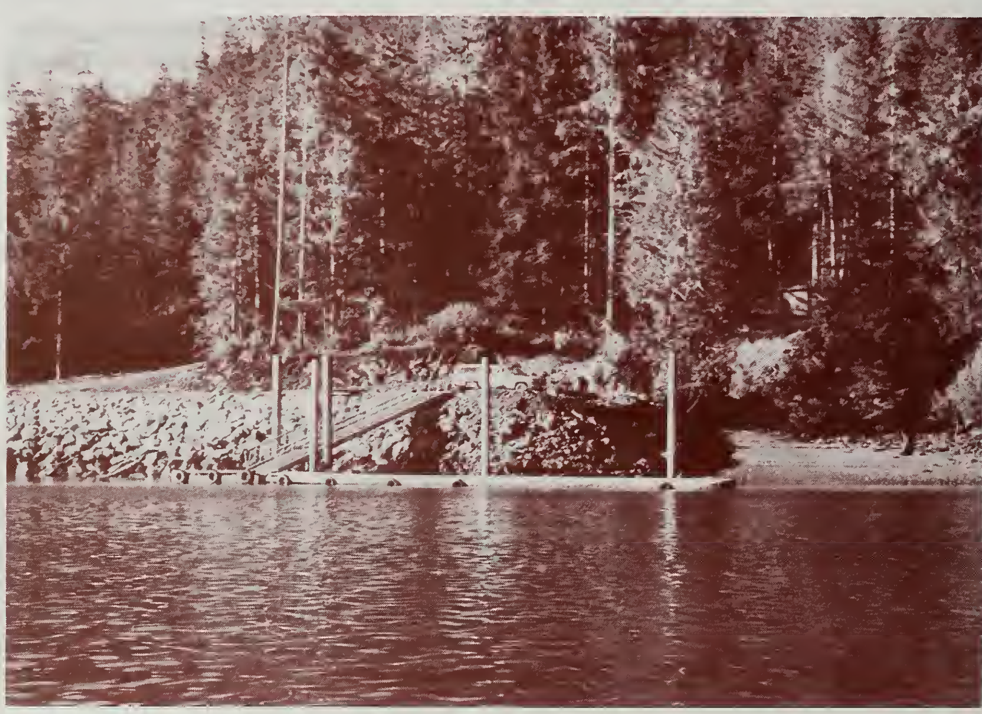
Alternative 1 would have no additional effects on public access. None of the four recreation places: Green Rocks Trail, Green Rocks Lake, Civilian Conservation Corps cabin area at Warm Fish Lake, or fishing access trail along Mitchell Slough, would be affected by proposed timber harvesting activities.

Alternative 2 would construct 21 miles of new roads. The new roads would provide access to the northernmost section of the Duncan Creek watershed and additional access to the Mitchell and Colorado Creek watersheds and to proposed harvest unit areas along Wrangell Narrows. Alternative 3 would construct the greatest increase in road mileage (26 miles). New public access would be provided into the northernmost section of Duncan Creek watershed and the central section of the Skogs Creek watershed. Existing roads would be extended into the Mitchell and Colorado Creek watersheds and into proposed harvest unit areas along Wrangell Narrows. Alternative 4 would construct about 24 miles of new roads, providing new access into the northernmost section of the Duncan Creek watershed, a central section of Skogs Creek watershed, and extend access into the Mitchell Creek watershed. Alternative 5 would construct the fewest miles of new roads (17 miles). New public access would be provided into the northernmost section of the Duncan Creek watershed, in addition to increased access into the Mitchell Creek watershed and proposed harvest units along Wrangell Narrows.

Recreation Opportunities

The South Lindenberg Peninsula is characterized mainly by large areas of temperate rain forest drained by numerous creeks and streams that flow into marine waterways. Currently the study area (58,344 acres) is partially roaded, having 58 miles of dirt and gravel roads as a result of previous timber sales. This setting provides for predominantly roaded modified and semi-primitive non-motorized recreation. Changes to the recreation setting from timber harvesting activities would directly affect recreation opportunities by shifting from the semi-primitive non-motorized ROS category (with its combination of activity, setting, and experience opportunities) to the roaded-modified ROS category (Table 4-30).

Access to the South Lindenberg road system is primarily via the Tonka LTF



Among the action alternatives, Alternative 3 would result in the greatest reduction in semi-primitive and non-motorized lands to approximately one-third of the existing area in this ROS class (Table 4-30). Alternative 5 would have the least effect, with a 50-percent reduction. Lands designated as semi-primitive motorized would not change significantly with less than a 10 percent reduction under any action alternative. Roaded modified acres would increase the most under Alternative 3 and the least under Alternative 5.

Short-Term vs. Long-Term Effects

Possible short term effects of the proposed action on recreation would be associated with road construction and timber harvesting activities. Noise and exhaust fumes from machinery would increase during road construction, timber harvesting, and log hauling. In addition, road construction and timber hauling could increase the possibility of traffic accidents. However, due to the limited amount of roaded recreational use in the study area (vehicles have to be barged to the peninsula), the short term effects of any of the action alternatives would not be significant.

In the long term, harvested units and closed roads would revegetate, permanent roads would remain, and new roads and units associated with future timber sales may occur. The long- term effects of the proposed action on recreation would be associated with increased ease of access to previously unroaded areas. All the action alternatives would extend permanent roaded access into the northwest corner of Duncan Creek and northeast portion of Mitchell Creek drainages. In addition, under alternatives 2, 3, and 5 there would be roaded access into the Colorado Creek drainage, and into the Skogs Creek drainage under alternatives 3 and 4.

Table 4-30

Acres and Percent Retained of Recreation Opportunity Classes

ROS Class	Existing Acres	2 Acres	%	3 Acres	%	4 Acres	%	5 Acres	%
SPNM	22,772	10,369	45	7,262	32	7,906	35	11,444	50
SPM	11,363	10,679	93	10,548	93	10,548	93	11,093	98
RM	24,182	37,269	154	40,507	168	39,863	165	35,780	148
R	27	0	0	0	0	0	0	0	0
Total	58,344	58,344	--	58,344	--	58,344	--	58,344	--

SPNM = Semi-primitive non-motorized; SPM = semi-primitive motorized; RM = roaded modified; R = rural.

Indirect effects resulting from the proposed action could include potential changes to roadless area designations and increased deer hunting opportunities that could impact deer populations in the study area. Potential impacts on rivers eligible for Wild and Scenic River status in the region are also discussed.

Roadless Areas

The Draft Forest Plan Revision (USDA Forest Service, 1991b) identified the roadless areas that meet the minimum criteria for potential inclusion in the National Wilderness System. Identifying this potential does not imply that areas should or should not be recommended for designation as wilderness, but is intended to portray the remaining undeveloped areas where wilderness is a future option. Roadless areas identified in the inventory may be considered for wilderness recommendations or may be managed for a wide range of other resource management activities. This inventory is not a land use designation.

The Lindenberg Roadless Area (as defined in the Draft Forest Plan Revision [USDA Forest Service, 1991a]) lies in the vicinity of the Skogs Creek drainage, which is directly south of the Petersburg Creek - Duncan Salt Chuck Wilderness and west of Wrangell Narrows. The

area currently provides semi-primitive non-motorized recreation opportunities. Alternatives 3 and 4 propose road construction and timber harvest activities into this Roadless Area. There is currently no suggestion to designate the Lindenberg Roadless Area as Wilderness.

The Green Rocks Roadless Area is in the southern portion of the Lindenberg Peninsula, adjacent to Wrangell Narrows and Duncan Canal. The area provides semi-primitive non-motorized and motorized recreation opportunities and includes the Green Rocks Trail and Green Rocks Lake. Alternative 2 proposes road construction and the harvest of several units within the Green Rocks Roadless Area. There is currently no suggestion to designate the Green Rocks Roadless Area as Wilderness.

Deer Hunting Opportunities

Under the proposed action, timber stands that would be converted from old-growth forest to even-aged stands would be less likely to be utilized as Sitka black-tailed deer winter habitat (see Wildlife section - Chapter 4). The loss of winter habitat would affect current deer populations, which are returning from the low levels of the last 20 years. Hunting opportunities may decrease if deer populations decrease substantially.

Wild and Scenic Rivers

In the development of the Draft Forest Plan Revision (USDA Forest Service, 1991f) and Draft Environmental Impact Statement (USDA Forest Service, 1991b), several hundred rivers on the Tongass National Forest were evaluated for possible inclusion in the National Wild and Scenic Rivers system. Eight rivers on Kupreanof Island were found eligible for designation as Wild and Scenic Rivers. None of these eligible rivers are located within the study area and the study area cannot be seen from within their respective Wild and Scenic River corridors. There would be no adverse effect on the eligibility and classification of any of these rivers on Kupreanof Island.

On nearby Mitkof Island distant views (approximately four miles away) of proposed harvest units located along the Wrangell Narrows viewshed would be visible from the mouth of Blind River. Under Alternative 2, eight units (121, 123, 125, 127, 128, 133, 134, and 136) could be seen. Under Alternative 3, four units (122, 124, 128, and 147), and six units under Alternative 4 (122, 124, 125, 127, 128, and 147) could be seen from the mouth of Blind River. Under Alternative 1 (no action) and Alternative 4, no units would be seen from this location. The five-mile section of the Blind River which flows into saltwater in the Wrangell Narrows is eligible for classification as a Recreational River. Because of the distance of the proposed harvest units from the river corridor, visual quality would not be significantly altered. The eligibility of Blind River for designation as a Recreational River is maintained.

Cumulative Effects

Reasonably foreseeable future actions which would lead to cumulative effects on recreation on the South Lindenberg peninsula include planned or scheduled timber sales. Adverse impacts would result from additional new road construction and further reductions in semi-primitive non-motorized recreation opportunities. Higher concentrations of people would be expected in a roaded setting; and since all methods of access and travel may occur within roaded areas, sights and sounds of people would most likely increase. New roads would allow access into areas previously undisturbed and hunting pressure and the number of deer harvested would likely increase.

Mitigative Measures

Closure and revegetation of new roads in the South Lindenberg study area would mitigate the potential impacts on recreation by preserving larger areas for non-motorized and semi-primitive recreation opportunities. While temporary roads are to be closed (tank trapped) under all alternatives, this is a relatively small proportion of the total new road miles proposed, and does not include revegetation. Road closures in addition to the temporary

roads are not proposed because it would not be in compliance with the established Road Management Objectives (RMO's).

Visual Resources

For the South Lindenberg timber sale, alternatives 1 (no action), 3, and 4 would achieve the visual management direction (VQOs) set forth in the Draft Forest Plan Revision (USDA Forest Service, 1991b). Alternatives 2 and 5 would not achieve the visual management direction set forth in the Draft Forest Plan Revision as a result of units 107 and 109 (refer to Chapter 3 for a description of VQO's). Units 107 and 109 proposed under Alternative 2, and Unit 107 proposed under Alternative 5, would not achieve the established partial retention VQO due to unit size and shape. In addition, Alternative 3, which was designed to satisfy the more restrictive Inventory VQO's (IVQO's), would do so for the entire study area except in the Duncan Creek drainage. In the Duncan Creek drainage, unit size and placement is not likely to achieve the established VQO of partial retention for units 6 and 16, and therefore would not satisfy the IVQO's.

Consequences Common to all Action Alternatives

In each of the alternatives for the South Lindenberg Timber Sale the following would apply:

Group selection units will be helicopter logged and would achieve a partial retention VQO. Units may be noticeable but would appear as natural openings in the landscape.

There would be fewer visual impacts from helicopter logged units than from cable-yarded units. No roads are required for the helicopter logged units, and more understory vegetation is preserved. This would give units a more "greened up" appearance immediately after harvesting. Cable-yarded units can take from three to five years to green up. In addition, most helicopter logged clearcuts would have feathered boundaries, which would appear more like natural openings in the landscape than cable-yarded boundaries.

New road segments would not be noticeable from the Wrangell Narrows (including Mountain Point) and Duncan Canal. Similar to the existing road system that cannot be seen from saltwater locations, the proposed roads would be located relatively low on the slope where intervening forest would screen views from the Wrangell Narrows, and Duncan Canal.

Few additional rockpits would be developed for road construction. Existing rockpits that were developed for previous timber sales would be used. Most of the existing rockpits are not visible from saltwater travel routes such as the Wrangell Narrows and Duncan Canal. Excavation of additional borrow material would be done in a manner that would not increase the visibility of the rockpits from these sensitive viewing locations.

Potential sites for rockpits were identified along Road 43520, some of which could be developed, particularly under alternatives 3 and 4, in order to extend Road 43520 into the Skogs Creek watershed. Most of these potential rockpit locations would not be seen from the Wrangell Narrows. However, potential sites at mile 2.87 and mile 2.98 could be visible. Development of these rockpits would be avoided, and if necessary, visual impacts would be mitigated through design.

In addition to units, roads, and rockpits, other ancillary facilities associated with the proposed timber sale include a secondary sort yard (primary sorting would be done at landings), and a log transfer facility (LTF). There are no logging camps associated with the proposed timber sale. The sort yard would be a one to two acre cleared and leveled area adjacent to roads 4350 and 6350, which are located in the valley floor of the Duncan Creek drainage (near units 28 and 37). The sort yard would not be seen from visually sensitive viewing areas and would not result in any adverse visual effect.

Comparison of Alternatives

The existing Tonka LTF would be used as the log transfer facility under all action alternatives. There would be no additional construction, and no adverse visual effects resulting from use of this existing facility. During harvesting, there would be much activity at the LTF which would be visible from the Wrangell Narrows. Activities would include the presence of logging trucks delivering logs to the LTF, heavy equipment moving logs from the trucks to a floating log raft anchored off the LTF, and shipping of the logs on the rafts through the Wrangell Narrows channel. This activity may provide a point of interest and possible interpretation for the public traveling along the Alaska Marine Highway.

To assess whether the alternatives would meet VQOs, the visual effects were evaluated from six viewpoints, five of which were located in the Wrangell Narrows viewshed and one in the Duncan Canal viewshed. None of the activities associated with the action alternatives would be seen from the South Peninsula viewshed, which includes the Beecher Pass Marine Park. The viewpoints that were selected for analysis were chosen because they were visually sensitive and representative of the views of the study area from that viewshed. To evaluate the visual effects of the alternatives, simulations of the proposed harvest activities under each alternative were developed using computer imaging technologies. The simulations are referenced under the discussion of each of the six viewpoints below. Table 4-31 summarizes the units seen in the middleground and background distance zone from each viewpoint.

Seen Areas

Wrangell Narrows Viewshed (VCU 447)

The visual effect of each action alternative was evaluated from five viewpoints within the Wrangell Narrows viewshed. Depending on the action alternative, the proposed action would affect from one to four percent of the acreage in this viewshed. Approximately two percent of the viewshed land base has been impacted by previous logging activities (roads and harvest units), for a cumulative disturbance ranging from three to six percent, depending on the action alternative. Alternatives 3 and 5 would have the greatest visual effect, followed by Alternative 2, whereas Alternative 4 would have little, if any, effect on this viewshed.

Viewpoint 1: South Petersburg–There would be no change in the view from South Petersburg under any of the action alternatives (Figure 4-13). A small ridge along the shoreline screens views of the units in Skogs Creek proposed under alternatives 3 and 4. The landscape would retain its existing appearance from this location.

Viewpoint 2: Beachcomber Inn–There would be no change to this view under alternatives 1, 2 and 5 (Figure 4-14). The landscape would retain its unaltered appearance, because no units are proposed in the viewshed under these alternatives. Under alternatives 3 and 4 there would be minor modifications to the landscape that would not be noticeable to the casual observer. Under Alternative 3, Unit 85 would be located in the middle ground and Unit 90 in the background. Unit 90 would also be located in the background under Alternative 4. Because these units are small in size, have a natural shape, and are located low on the slope, they would achieve the partial retention VQO, which is to remain visually subordinate to the characteristic landscape.

Viewpoint 3: Raven's Roost–Because of the panoramic vista and superior position of the observer viewing the landscape (i.e., above), units could be seen in the middle ground and background distance zones under all the action alternatives, although most units would not be noticed by the casual observer (Figure 4-15). Under alternatives 2 and 5 Unit 107 would be located on the periphery of the view, to the south. This 49 acre unit is located on a north-facing slope in the narrow drainage just south of Mountain Point. The upper portion of the unit can be seen from the Wrangell Narrows and Petersburg Highway. Feathering of the upper boundary of this unit is proposed as mitigation to reduce the visual effect of the unit.

Table 4-31
Harvest Units Seen from Viewpoints by Distance Zone

No.	Viewpoint	Alt 2		Alt 3[a]		Alt 4		Alt 5	
		Mg[b]	Bg[b]	Mg	Bg	Mg	Bg	Mg	Bg
1	South Petersburg	--	--	--	--	--	--	--	--
2	Beachcomber Inn	--	--	85	90	--	90	--	--
3	Raven's Roost	107	69	85	31	--	31	107	31
		--	--	***110***		--		--	
		--	--	--	69	--	69	--	69
		--	--	--	--	90	--	90	--
		--	--	--	94	--	94	--	--
4	Papke's Landing	65	--	65	--	65	--	65	--
		109	--	***104***	--	115	--	***104***	--
		119	--	***108***	--	--	--	***108***	--
		120	--	***110***	--	--	--	111	--
		121	--	***122***	--	--	--	***118***	--
		123	--	***124***	--	--	--	***122***	--
		125	--	***147***	--	--	--	***124***	--
		127	--	--	--	--	--	125	--
		--	--	--	--	--	--	127	--
		--	--	--	--	--	--	***147***	--
5	Blind Point	121	--	128	--	--	--		
		123	--	--	--	--	--	125	--
		125	--	--	--	--	--	127	--
		127	--	--	--	--	--	128	--
		128	--	--	--	--	--	--	--
		133	--	--	--	--	--	--	--
		134	--	--	--	--	--	--	--
		136	--	--	--	--	--	--	--
6	Indian Point	6	2	6	2	6	2	6	2
		16	24	16	24	16	20	16	20
		--	--	--	31	--	24	--	24
		--	--	--	--	--	31	--	31

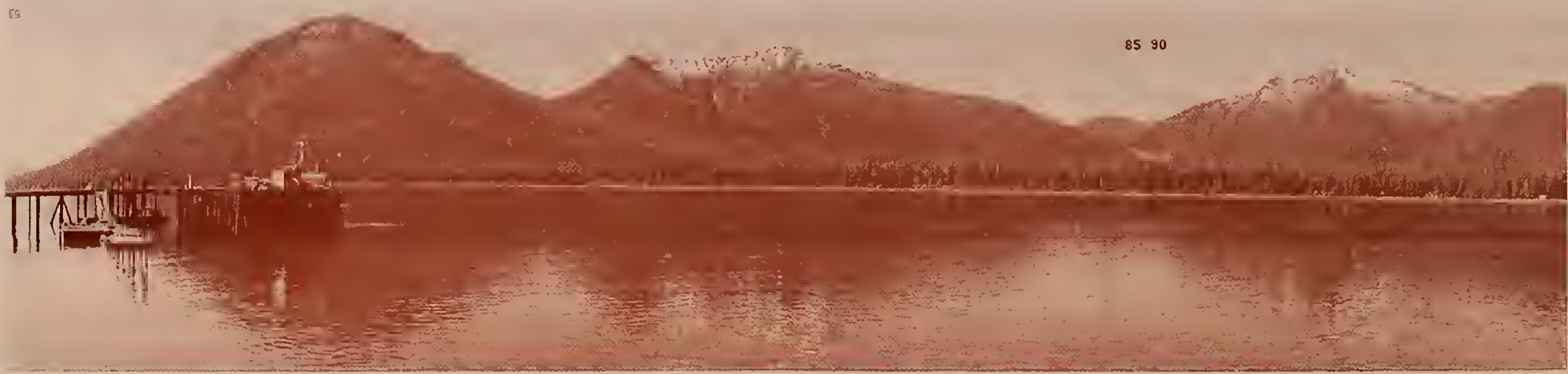
Note:
[a] Units in bold italics have a group selection prescription
[b] Mg = Middle ground (0.5 - 5.0 miles) Bg = Background (>5.0 miles)

Alternatives 1 through 5

Figure 4-13. Simulations of Alternatives for Viewpoint 1, South Petersburg

Alternatives 1, 2, and 5

Alternative 3



Alternative 4

Figure 4-14. Simulations of Alternatives for Viewpoint 2, Beachcomber Inn

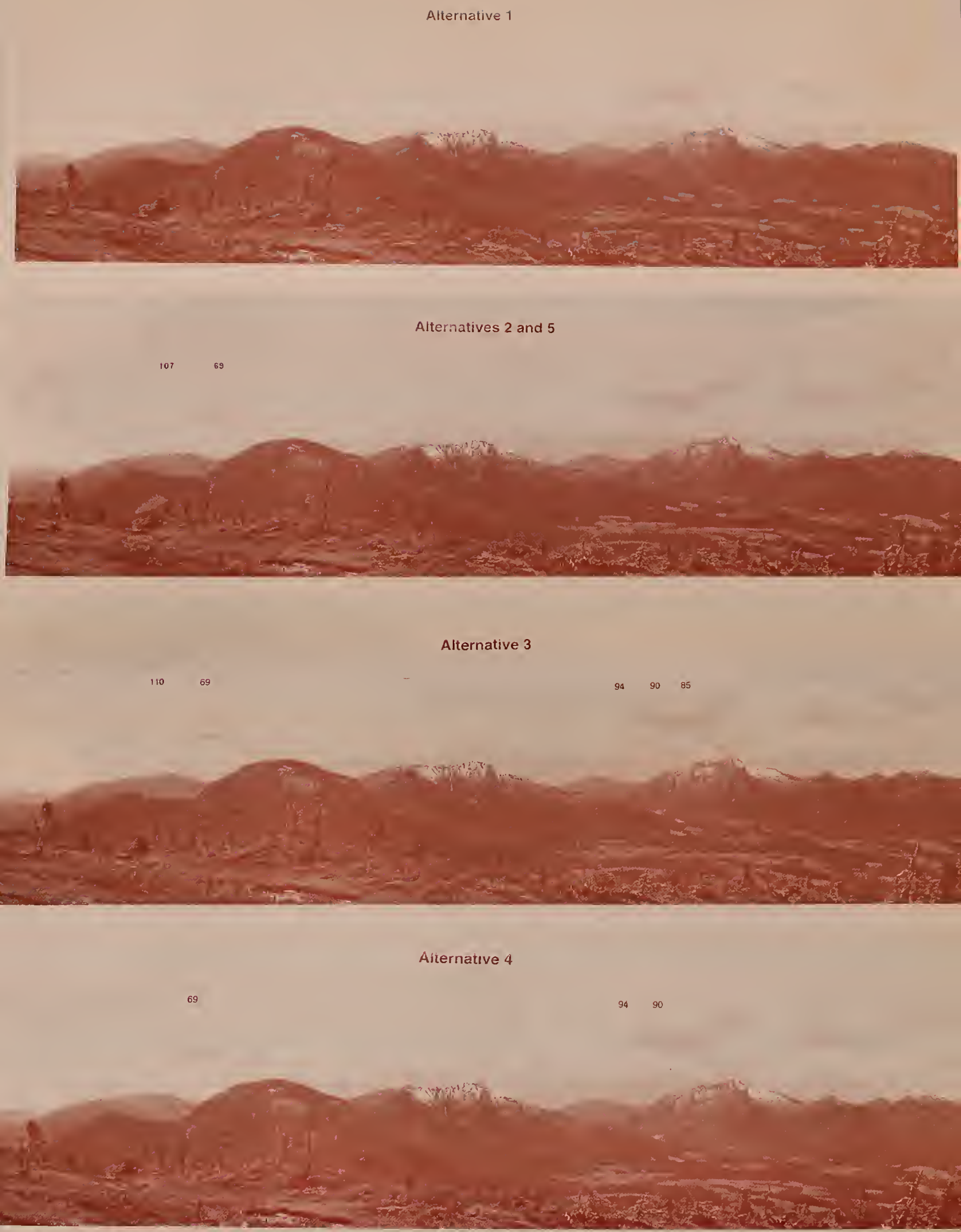


Figure 4-15. Simulations of Alternatives for Viewpoint 3, Raven's Roost

However, from Raven's Roost the entire unit could be seen and may attract attention. This unit would achieve the modification VQO.

Other units that could be seen from this vantage point under all the action alternatives is Unit 69, which is located to the south in the background distance zone. This unit would achieve a partial retention VQO from this location because it blends into the characteristic landscape. It would not be noticeable to the casual observer due to the distance from which it is viewed.

Under alternatives 3, 4, and 5, the upper portions of units 31 and 34 in the Duncan Creek drainage (not shown in the simulations) could also be seen from this location. These units would be helicopter logged, with feathered boundaries that mimic the natural openings on the valley walls. A partial retention VQO would be achieved for units 31 and 34.

Unit 85 would be seen in the middle ground distance zone under Alternative 3, and units 90 and 94 would be seen in the background under alternatives 3 and 4. The viable portions of these units are small in size, and appear as natural occurrence that would not be noticeable to the casual observer. A partial retention VQO would be achieved under alternatives 3 and 4. Under alternatives 2 and 5, the VQO of partial retention established in the TLMP Revision would not likely be achieved as a result of Unit 109 under Alternative 2, and Unit 111 under Alternative 5.

Viewpoint 4: Papke's Landing–The view from Papke's Landing would appear to be noticeably altered under Alternative 2, but not under alternatives 3, 4, and 5 (Figures 4-16 and 4-17). Under alternatives 3, 4, and 5, the introduction of new units into the landscape would appear as naturally caused disturbances and would not be noticed by the casual observer. A VQO of partial retention would be achieved from this viewpoint for these alternatives. Under Alternative 2, the VQO of partial retention established in the TLMP Revision would not likely be achieved as a result of Unit 109. This unit would achieve the modification VQO.

Under Alternative 2, several small clearcuts would be seen along the base of the ridge facing the landing. The proposed units would be similar in shape and size to the existing units, but they would be more visible because of greater color contrasts (the new units would not be green like the existing units) and would be slightly higher on the slope. To the north, the separation between two existing units would be removed (Unit 109) creating one continuous unit along the base of the slope. To the west, a portion of Unit 65 may be noticeable behind the Unit 109 ridge, although it is over three miles away.

Alternative silvicultural techniques (group selection) are proposed for most of the units seen from this location under Alternative 3. Fifteen percent of units 104, 108, 110, 122, and 124 would be harvested by helicopter in 1.5 to 2.5 acre "patch cuts." To the north, a few of the patch cuts in Unit 104 on Mountain Point may be noticeable although they would be over 3 miles away. For units 108 and 110 there would be about 10 patch cuts between the two units, which would be dispersed across the slope above the two existing units. For units 122, 124, and 147 there would be a total of about 24 patch cuts dispersed along the ridge line that faces Papke's Landing.

The exact location of the patch cuts would not be known until the time of harvesting. The color contrasts created by harvesting these group selection units is assumed to be less than traditionally harvested units, because helicopter logging tends to preserve more of the understory vegetation. Therefore, less disturbance would be evident at the time of harvesting.

Alternative 4 would have the least visual effect on the view from Papke's Landing of any of the action alternatives. Under this alternative Unit 115, a small clearcut, would be

introduced into the middle ground landscape at the north end of the ridge that faces Papke's Landing, and the upper portion of Unit 65 would be seen in the background distance zone.

Alternative 5 would result in a combination of small to moderate-size clearcuts and patch cuts. To the north towards the Tonka LTF, one could see several patch cuts associated with units 104 and 111 also the clearcut of Unit 65. Along the ridge that faces Papke's Landing, one could see the four small patch cuts associated with Unit 118, which rounds the edge of the ridge to the north; the 24 patch cuts associated with units 122, 124, and 147 across the face of the ridge; and two small clearcuts associated with units 125 and 127 at the base of the ridge.

Viewpoint 5: Blind Point–There would be no change to this view under alternatives 1 and 4. The landscape would retain its current untouched appearance. Harvest activities proposed under alternatives 2, 3, and 5 would not be noticed by the casual observer.

Under Alternative 2, several small to moderate size clearcuts would be dispersed across the ridges of the study area that are seen from this location. The units are subordinate to the characteristic landscape because of their small size (ranging from 9 to 30 acres), and they are located low on the slope. The landscape changes would be noticed but would not attract attention. A partial retention VQO would be achieved.

Under Alternative 3, the patch cuts associated with four group selection units would not be perceived from this viewpoint. The one clearcut (Unit 128) would be located in a small saddle between the two ridges. The changes to the landscape under this alternative would not be noticed by the casual observer, and a VQO of partial retention would be achieved.

Alternative 5 would have a slightly greater visual effect on the view from this location than Alternative 3 because of the presence of two small clearcuts (units 125 and 127) in addition to group selection units (122, 124, and 147). The landscape changes would be noticed but would not attract attention. A VQO of partial retention would be achieved.

None of the alternatives would affect the eligibility of the candidate Blind River (on Mitkof Island) for Wild and Scenic River designation. The study area can be viewed to the greatest extent from the mouth of the Blind River. From this location, alternatives 1 and 4 would achieve a retention VQO, while alternatives 2, 3, and 5 would achieve partial retention.

South Peninsula Viewshed (VCU 448)

Views of proposed units on the South Lindenberg Peninsula would not be noticeable from saltwater areas south of Kupreanof Island because of intervening topography and distance. There are no proposed units and only one existing unit in VCU 448. For this reason, the cumulative visual disturbance is less than one percent under all alternatives. Proposed units in the Wrangell Narrows viewshed are more than three miles away and small in size (1–30 acres), such that the contrasts created are not noticeable from this viewshed. There are no views of proposed units in the Duncan Canal viewshed because of intervening topography and the location of most proposed units in interior valleys. Therefore, there would be no visual effect on the sensitive viewing locations in the South Peninsula viewshed including the Forest Service Beecher Pass Cabin and the Beecher Pass State Marine Park.

Duncan Canal Viewshed (VCUs 437 and 439)

The Duncan Canal viewshed consists of two VCUs: 437, which encompasses the Mitchell Creek drainage, and 439, the Duncan Creek drainage. The Mitchell Creek VCU has been roaded and harvested during previous entries into the study area, although most of this landscape disturbance is not seen from Duncan Canal. Proposed units and roads for this VCU would add between three and four percent more disturbance to the land base for a

Alternative 1

Alternative 2

120 119 65

Alternative 3

122 65 108 110 104

Alternative 4

65 115

Alternative 5

122 118 65 108 111 104

Figure 4-16. Simulations of Alternatives for Viewpoint 4, Papke's Landing

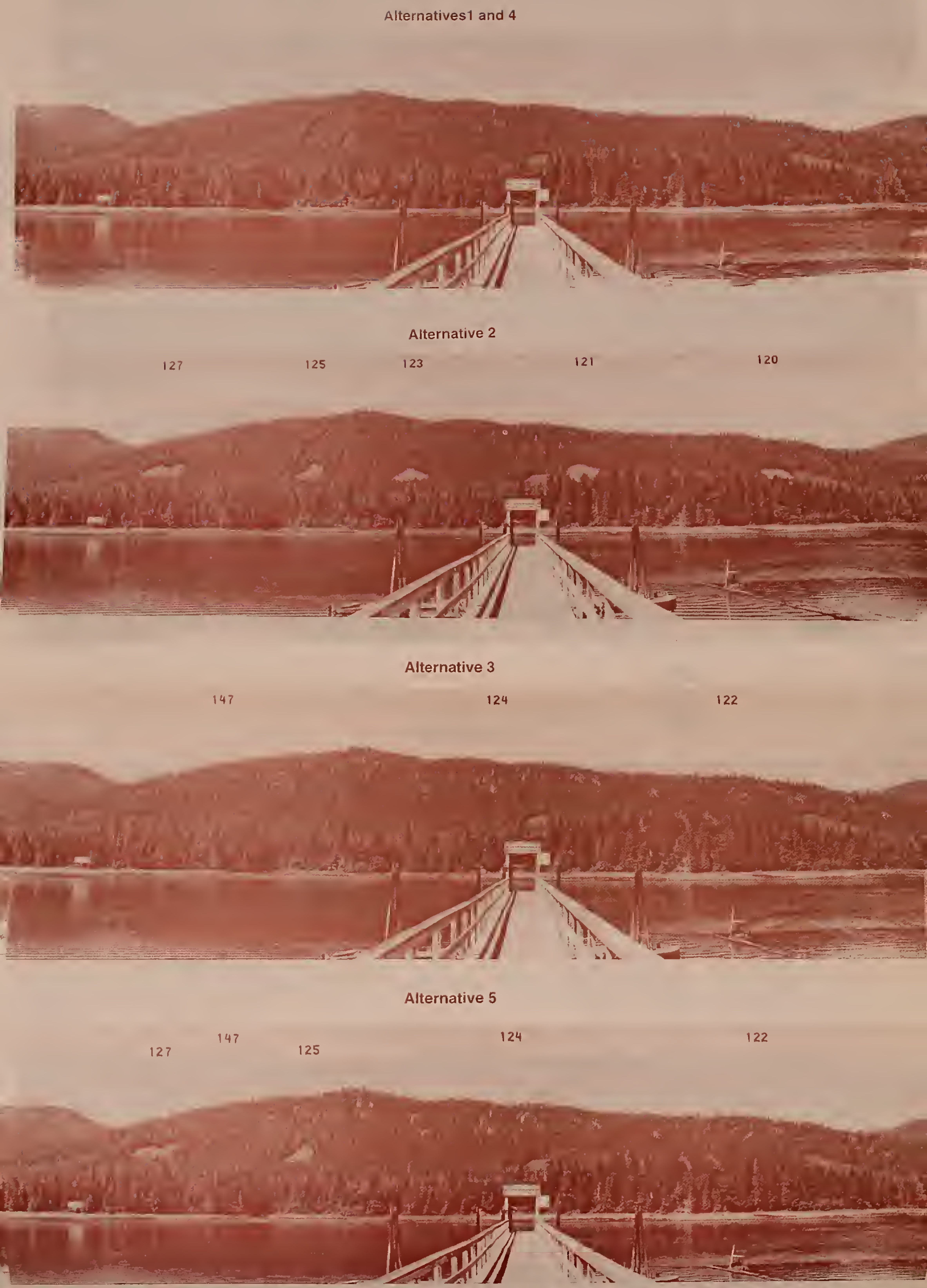
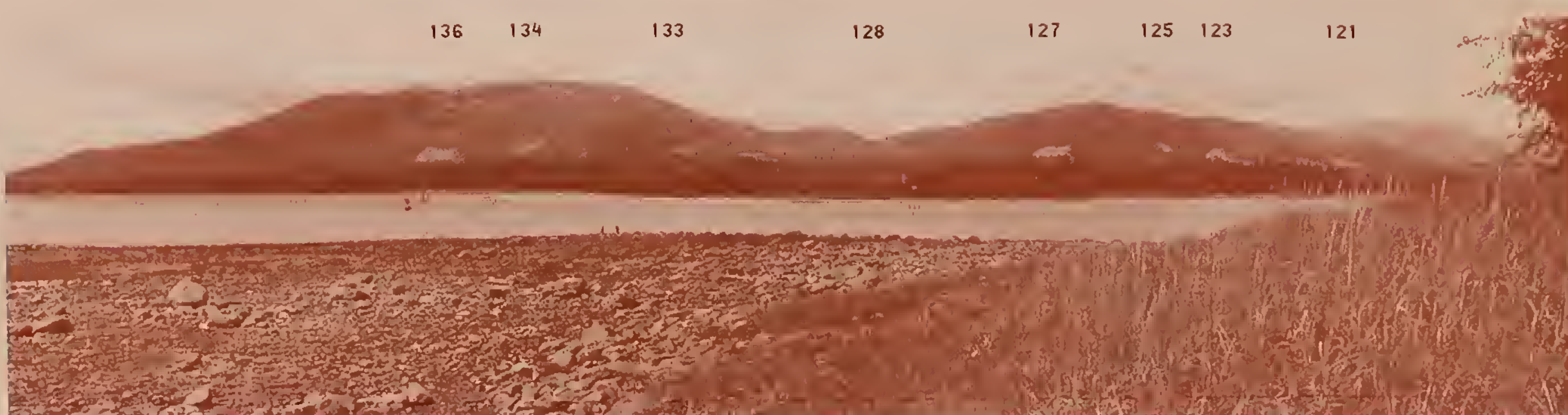


Figure 4-17. Simulations of Alternatives for Viewpoint 4, Papke's Landing (southwest view)

Alternatives1 and 4

Alternative 2



Alternative 3

Alternative 5

Figure 4-18. Simulations of Alternatives for Viewpoint 5, Blind Point

cumulative effect of 14 to 15 percent. Because the Mitchell Creek VCU is not seen from Duncan Canal, there would be little visual impact to the Duncan Canal viewshed.

In the Duncan Creek VCU previous harvesting, which is not seen from the saltwater of Duncan Canal, has affected five percent of the land base. The South Lindenberg Timber Sale would affect an additional four to six percent, depending on the action alternative. However, the visual effect of the alternatives on the view from Duncan Canal would not vary significantly. In contrast to the existing harvest activity in the Duncan Creek drainage, the proposed units would be visible from Duncan Canal, as shown by the view from Indian Point (Viewpoint 6).

Viewpoint 6: Indian Point Viewpoint–The view of the Duncan Creek watershed would be affected similarly under all the action alternatives (Figure 4-19). Changes to the landscape would be easily noticed, may attract attention, and could dominate the characteristic landscape. Except for Unit 16, the units that could be seen from Duncan Canal would be located on the north side of the valley walls and would not face directly towards the canal which would reduce the visual impact of the units. All of the alternatives would achieve the VQO of modification as established in the 1991 DraftTLMP Revision. However, Alternative 3, which was designed to meet the Inventory VQOs (IVQOs), would not achieve the VQO of partial retention that is established for some of the area seen from Duncan Canal. The size of the units under Alternative 3 are too large to achieve a partial retention VQO, but would achieve the modification VQO.

Under Alternative 2, most of two fairly large units (6 and 16) would be seen in the middle ground distance zone. The upper portions of two other large units (2 and 24) would be seen in the background. Like Alternative 2, under alternatives 3, 4, and 5, units 6 and 16 would be seen in the middle ground, and Unit 2 in the background. In addition, under alternatives 3, 4, and 5 units 24 and 31 would be seen in the distant background near the head of the Duncan Creek drainage. And, under alternatives 4 and 5, Unit 20 would be seen in the background, located between units 16 and 24.

Not Seen Areas

While the viewpoint locations are representative of views most commonly seen by people in the study area, there are other areas that would be affected by timber harvesting activities that are not commonly seen. Generally these areas cannot be seen from saltwater travel routes and are visited primarily by hunters and subsistence users. These areas include: the headwater valley of Skogs Creek; the south-side drainages of Duncan Creek; and the north, south, and northeast sides of the Mitchell Creek drainage.

Alternatives 3 and 4 propose units and a road in the Skogs Creek drainage and alternatives 2 and 5 do not. Alternatives 3 and 4 would achieve the partial retention VQO for this area.

Alternative 2 does not include additional harvesting in the south drainages of Duncan Creek, whereas alternatives 3, 4, and 5 do (units 36, 39, 41, 42, and 43). Alternatives 3, 4, and 5 would achieve the modification VQO.

All of the action alternatives include some units to be harvested in the north side of Mitchell Creek drainage. Alternative 5 would result in the least visual impact. Alternatives 2 and 4 would include some larger units adjacent to existing units (58 and 56M), which would achieve the modification VQO. Under Alternative 3, the VQO of partial retention would not be achieved because of the size of units 58 and 56M and the concentration of existing and proposed units in this area.

All of the action alternatives include most of the proposed units on the south side of the Mitchell Creek drainage (62, 63, 64, 69, 71, 138, and 140). Most of these units are small

and are extensions of existing units. Unit 69 is large, but all alternatives would achieve the modification and maximum modification VQOs.

In the northeast corner of the Mitchell Creek drainage several of the action alternatives include units 57, 65, 66, 68, 142, and 145 and would meet the maximum modification VQO. Alternative 3, which omits units 57, 145, and 68, would achieve the modification VQO.

Cumulative Effects

Most of the South Lindenberg Peninsula is, and will continue to be, allocated in the Forest Plan for timber production. The Draft Forest Plan Revision (USDA Forest Service, 1991b) projects that 32 percent of the Duncan Canal viewshed (VCUs 437 and 439) and 24 percent of the Wrangell Narrows viewshed (VCU 447) would be scheduled for harvesting over the next 160-years.

Existing harvest units and roads currently affect six percent of the total land base in the study area (Table 4-32). The vast majority of this activity has occurred in the Duncan Canal viewshed, where nearly 10 percent of the land base has been affected by timber harvest activity associated primarily with the Tonka Timber Sale. Such interior valleys as Duncan Creek and Mitchell Creek have been attractive for timber harvesting because the areas are not commonly seen. In contrast, very little logging has occurred in the Wrangell Narrows viewshed (less than two percent of the total land base), because much of the land base is highly visible.

Table 4-32
Area of Harvest Units and Roads in Each Viewshed by Alternative

	Viewshed[1]							
	Wrangell Narrows		Duncan Canal		South Peninsula		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
Alternative 1	316	1.8	3,288	8.7	33	1.2	3,637	6.2
Alternative 2	365	2.0	1,369	3.6	0	0	1,734	3.0
Alternative 3	222	1.3	1,503	4.0	0	0	1,725	3.0
Alternative 4	28	0.2	1,787	4.7	0	0	1,815	3.1
Alternative 5	342	1.9	1,385	3.7	0	0	1,727	3.0

[1]Areas of viewsheds as follows: Wrangell Narrows = 17,678 acres; Duncan Canal = 37,938 acres; South Peninsula = 2,719 acres; total South Lindenberg study area = 58,344 acres.

All of the action alternatives would result in a 3 percent increase in the study area land base that has been disturbed by timber harvest activity. Combined with the existing unit and road areas, this would result in a cumulative disturbance of nine percent. Cumulative effects on the visual resource would be greater than nine percent, because visual disturbance is seen in the context of the surrounding landscape and not as discrete units and roads. To achieve the management goals of the Forest Plan, two to three more entries similar to the South Lindenberg Timber Sale would be anticipated.

While the total cumulative effect of the timber harvest activity in the study area would be similar under all the action alternatives, the effects of the alternatives would differ by viewshed. Under Alternative 1, no additional disturbance would occur to the visual resources of the study area. In areas where harvesting has occurred, the visual appearance of

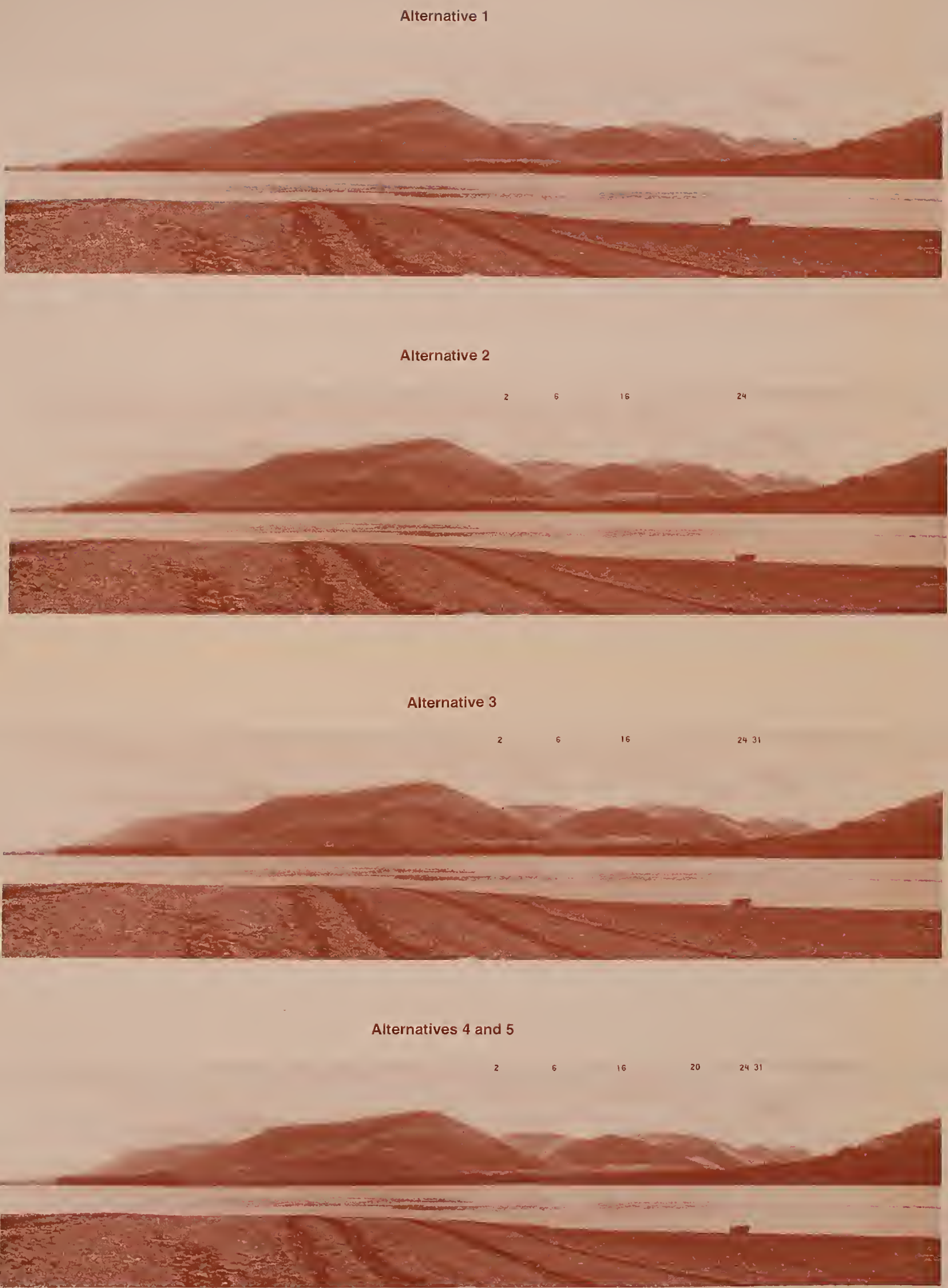


Figure 4-19. Simulations of Alternatives for Viewpoint 6, Indian Point

the landscape would improve as harvest units mature and visual contrasts soften. With no future entries, the area would return to a near natural appearance in 60 to 80 years. However, Forest Service objectives for multiple use management would most likely result in future plans for harvesting the Lindenberg Peninsula. If harvesting is deferred to a later date, other regulations and policies affecting timber harvesting could change with time and become either more or less restrictive. This could affect the level of visual disturbance that would be allowed in future entries.

Wrangell Narrows Viewshed

In the Wrangell Narrows approximately two percent of the land base has been effected by timber harvest activities. Alternative 4 would have relatively no effect. Alternatives 2 and 5 would result in the greatest effect (two percent), with a cumulative effect of four percent.

The view from South Petersburg, the Beachcomber Inn, and Raven's Roost are primarily of the Skogs Creek watershed. This watershed is a highly scenic landscape that has not previously been entered into for harvesting, and there are no existing roads or units. The natural appearance of the landscape would be altered under alternatives 3 and 4, which introduce two to three harvest units and approximately 10 miles of new road. The cumulative effect of the proposed units would achieve the established VQOs. The development of a new road would likely increase the potential for future harvest in this area. This viewshed could absorb more disturbance to the landscape from timber harvesting, if units are kept small and naturally appearing, and roads are kept low on the slope.

The view from Papke's Landing encompasses the southern portion of the study area seen from the Wrangell Narrows viewshed. This landscape lies directly across from Papke's Landing and has been disturbed by previous harvesting. These existing units have matured and are not noticed by the casual observer. Under the action alternatives, new units would be introduced into the viewshed and the cumulative effect of past and present units would achieve the established VQOs. However, the capability of this landscape to absorb additional change in the future is low due to the cumulative effect of the past disturbance and that proposed for this timber sale. Future entries should not occur in this area until the proposed units achieve a near natural appearance.

To the south of Papke's Landing, the landscape (area seen from Blind Point) is natural in appearance and no harvesting or road development has occurred in the area. Under alternatives 2, 3, and 5 a new road and several units would be introduced into the landscape. Under Alternative 2, the road and harvest units would extend further south into the study area than under any of the other alternatives. The presence of this road would increase the likelihood of future harvesting in the southern portion of the study area. This viewshed has the capability to absorb a moderate amount of change in the future. Much of the landscape is highly visible from the Wrangell Narrows, and VQOs of retention and partial attention would need to be achieved. Project planning would require substantial design input and the use of less traditional harvesting techniques for implementation.

South Peninsula Viewshed

Past harvesting activities affect roughly one percent of the existing land base of the South Peninsula viewshed. No additional disturbance would result from the South Lindenberg Timber Sale. The extension of Road 6355 to the northern boundary of this viewshed (VCU 488) under Alternative 2 would increase the likelihood of future entries into the viewshed. This viewshed has a moderate capability to absorb visual change to the landscape. Much of the landscape is highly visible from saltwater locations, and VQOs of retention and partial attention would need to be achieved. Project planning may require

substantial design input and the use of less traditional harvesting techniques for implementation.

Duncan Canal Viewshed

Although Alternative 4 would have little effect on the Wrangell Narrows viewshed, it would have the greatest effect on the Duncan Canal viewshed. With an existing disturbance of nearly nine percent, the cumulative effect of Alternative 4 would be more than 13 percent. Alternatives 2 and 5 would have the least effect, with a cumulative effect of less than 13 percent.

The view of the study area from Indian Point focuses on the Duncan Creek watershed. Although timber harvest activity has occurred in this watershed, it is not seen from Duncan Canal. The proposed units would be seen. The capability of the landscape to absorb more visual change is moderate, and some additional harvesting could occur.

Not Seen Areas

In the Mitchell Creek watershed, which is not seen from the saltwater, previous harvesting has resulted in landscape changes that are strong and obvious to the average forest visitor. Additional units would contribute to the existing character of the landscape. Future entries in the near term could result in unacceptable modifications to the landscape. It would be 40 to 60 years before future entries in this area would be visually acceptable.

In conclusion, most areas of previous harvesting have a low capability to absorb more visual disturbance. This means that future harvest entries would most likely focus on those areas that are naturally appearing now, such as Skogs Creek watershed and the southern end of the Lindenberg Peninsula. These areas are highly visible from the visually sensitive saltwater travel routes of the Wrangell Narrows and Duncan Canal. Future sales would most likely have fairly restrictive VQOs, such as retention and partial retention, which would require more design and alternative silvicultural prescriptions than traditional timber harvests.

Mitigative Measures and Monitoring

Significant planning and design for the visual resource went into the development of the South Lindenberg Timber Sale. Due to the high visual sensitivity of the study area, 70 percent of the proposed units in the unit pool were modified to address visual concerns. Mitigation measures were incorporated at all phases of the planning and analysis of the project. This included eliminating units from the unit pool, reducing the size of units, use of alternative silvicultural prescriptions, and boundary modifications. Additional measures are proposed in the monitoring section below to insure successful implementation of the design measures that were developed.

Numerous units were dropped by the ID Team during the planning of the unit pool due to a combination of resource concerns, including the visual resource. This included units proposed along the face of Mountain Point that would have been highly visible from the Wrangell Narrows (units 101, 102, 112), several large units on an east facing slope in the north of Skogs Creek that could have been seen from Petersburg (units 80-84, 88, 89), units (10-13) proposed on a prominent ridge in Duncan Creek that would have been close to the saltwater of Duncan Canal and highly visible, and units (73 - 79) that were proposed along the southern shore of the Duncan Canal near existing units, which would have been highly visible.

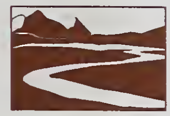
Further refinement of harvest unit design occurred throughout the analysis of alternatives. Unit boundaries were rounded or undulated in order to blend into the surrounding landscape. Alternative silvicultural prescriptions were proposed for 10 of the 77 units in the unit pool,

and special treatments, such as feathering of boundaries for helicopter logged units and leaving reserve tree clumps, were proposed to achieve VQOs.

Monitoring

In addition to the mitigation measures that have been incorporated in the timber sale, the following measures are proposed to ensure that these measures are successfully implemented.

To ensure that group selection units are harvested in a manner that reduces visual impacts to the greatest extent possible, a landscape architect will be involved in implementation.



If the potential rockpits located near Mountain Point (Road 43520 milepost 2.87 and 2.98) are to be developed for the South Lindenberg Timber Sale, a landscape architect will be involved in the planning and design of the rockpits to incorporate mitigation measures.

Cultural Resources

Past Cultural Environment

Archaeological and architectural features in Southeast Alaska are fragile, non-renewable resources known to reflect almost 10,000 years of the past cultural environment. In addition, they are often an aid in reconstructing past natural environments. Although no experiments have been conducted in the Tongass National Forest to determine the effects of logging techniques on particular cultural resource site types, studies completed elsewhere in the National Forest system have determined that the potential exists for logging to physically disturb the context or position of cultural remains, and to physically destroy artifacts and features. It is assumed that the logging and associated road-building on the Lindenberg Peninsula could affect sites directly. Increased human visitation to cultural sites on the Lindenberg Peninsula would be expected as a result of renewed logging and an increase of recreational users encouraged by improved roading. Changes in erosion and sedimentation of the intertidal zone brought about by logging on nearby uplands may have the potential to affect cultural sites such as fish traps. The cultural resource investigation produced data with which to evaluate the likelihood that logging and associated road-building would directly disturb cultural properties eligible for inclusion in the National Register of Historic Places.

The USDA Forest Service model of cultural site density in Region 10 defines the zone between sea level and the 100-foot contour as having a high probability for sites. In March of 1994 the proposed unit pool was almost entirely above the 100-foot elevation, with only nine units having part of their perimeter below the 100-foot contour. Survey of the area below the 100-foot contour in each of those nine harvest units revealed no cultural sites eligible for the National Register. Subsequently, those nine units were struck from the proposed unit pool. Thus none of the area proposed for logging in the South Lindenberg Peninsula timber sale lies below 100 feet in elevation. Nor are any new roads planned below the 100-foot elevation. Confining the proposed logging to the area above the 100-foot contour where the expected cultural site probability is low should make the probability of disturbing undiscovered National Register-eligible cultural sites comparably low. No sites eligible for the National Register are known to be within the proposed unit pool. Supplemental cultural resource surveys along the marine shore, along with historic land use information acquired through oral history, do not contradict the expectation that upland site density would be low.

Four of the six cultural properties newly-documented as Alaska Heritage Resource Survey (AHRS) sites–as well as the known inventory of AHRS sites on the Lindenberg Peninsula–are judged eligible to the National Register. They are the Warm Fish Lake Cabin

(PET-392), Island Point Fish Trap (PET-394), Woody Island Fish Trap (PET-395), and McDonald Arm Fish Trap (PET-393). None are within the proposed unit pool or new road right-of-ways, and thus none are directly threatened by ground-disturbing activities. The potential for indirect impacts to these sites due to increased human visitation and intertidal sedimentation depends in part on the nature of the individual site and was not quantified as part of this study.

The Forest Service sent copies of the cultural resource report, prepared under Section 106 of the National Historic Preservation Act, to the Petersburg Indian Association and the Organized Village of Kake to solicit their opinion on the report's conclusions and recommendations. The Forest Service did not receive any comments. The Forest Service views this draft EIS as an opportunity for Native Americans and others to review, analyze, and provide comments on cultural resources that are possibly not recorded or have not been considered.

A detailed report of the cultural resource investigations, prepared in compliance with Section 106 of the National Historic Preservation Act of 1966, was prepared and submitted to the Alaska State Historic Preservation Officer (SHPO) for review (Mobley, 1995). Based on that information, the SHPO concurred that there are no known significant heritage properties in the area of potential effect. The SHPO agreed that the four above-mentioned cultural sites, which are outside of the area of potential effect, were eligible to the National Register of Historic Places. The SHPO concurred that more information is needed to evaluate the Warm Fish Lake Trail, Mitchell Slough Fish Weir (PET-396), and Tonka Cannery (PET-046). The SHPO also concurred that the Sandburg Petroglyph (PET-400) as it is now documented is not eligible. In providing these concurring opinions, the SHPO has concluded the consultation requirements the U.S. Forest Service must meet under Section 106 of the National Historic Preservation Act.

Cumulative Effects

Cumulative impacts to cultural resources in the Tongass National Forest may result from natural erosion and sedimentation, as well as cultural processes such as public use, commercial development, and timber harvest. Most types of recorded cultural sites in the Tongass National Forest are concentrated near the marine shore, so the cumulative effect of timber harvest at higher elevations–outside of the high cultural resource probability zone, as in the case of the South Lindenberg project–is to increase the risk of disturbing a small number of undiscovered sites. Such higher elevation sites are likely small and probably reflect specialized activities less often practiced near the marine shore. Commercial development is not expected with the South Lindenberg project, so its cumulative effect on cultural resources is minimal. Increased public use accompanying the South Lindenberg project would bring people into more contact with the few recorded cultural resources, and perhaps with undocumented examples as well. Continued local education efforts by the Forest Service will increase public awareness about the cultural resources and assist the agency in collecting additional information to manage the region's heritage sites.

Monitoring

As specified in a programmatic agreement between the Forest Service Advisory Council on Historic Preservation, and the Alaska SHPO, the Forest Service will monitor all direct impact areas (for example roads, timber harvest units, rock pits) during and/or after the actual ground disturbance. Archaeologists will examine exposure for the presence of buried cultural resources. If sites are discovered, the Forest Service will evaluate their potential eligibility to the National Register. If any National Register eligible sites are discovered during the process, the Forest Service will consult with SHPO and the Advisory Council to develop measures to negate any adverse affects.

Economics

There are three broad economic aspects of importance to this project. The first is the context within which the proposed actions are to take place, that is, the existing economic and social environment. The second aspect deals with the impacts of each alternative on the existing

situation, which primarily focuses on regional impacts within Southeast Alaska. The third aspect is the internal and comparative economics of the proposed alternatives, which concerns the economic efficiency of the sale and harvest of timber as proposed under each alternative.

The impacts of the proposed South Lindenberg project on the local and regional economy are directly related to the volume production. Data were found in published sources regarding direct and indirect employment generated per unit of volume and average annual income per employee in the timber industry of Southeast Alaska. Contribution to gross national product (GNP) was estimated by using the dollars per thousand board feet average value of the end products sold by the industry. These end-product values were determined from the mid-market appraisal data supplied by the Forest Service for the Tongass National Forest. These values are a useful proxy for regional contribution to GNP.

The internal and comparative economics for each alternative are based on the latest data and procedures for mid-market timber appraisals as developed and reported by the Forest Service for the Tongass National Forest. These data include selling values and costs collected from southeast Alaskan industry operation, updated to the current period.

The Draft Forest Plan Revision provides for an annual allowable sale quantity of 418 million board feet (USDA Forest Service, 1991b). The Forest Service is charged with the responsibility of providing that quantity from selected areas of the forest while conforming to standards and guidelines designed to protect the various other resources and the overall environment. Because of the world wide shortage of softwood timber, the cancellation of the APC long-term contract probably will have little effect on world wide demand for sawn products and pulp. However, the closure of the Sitka pulp mill and the Wrangell sawmill has reduced local demand significantly. Without the long term contract, the pulp mill is unlikely to reopen. The reopening of the Wrangell sawmill is also questionable unless the Tongass independent sale program can be significantly increased and maintained in order to achieve the annual Tongass harvest goal of 418 million board feet. In spite of this, demand for Tongass timber should be sufficient to absorb the volume from the South Lindenberg area. Also, one can assume that if a certain volume is not produced from the South Lindenberg area, it will be provided from some other area. The employment, income, and contribution to GNP attributable to the alternatives for this project should be considered contributions to the otherwise declining timber-related economy of the region. Therefore, these effects would be beneficial for the local economies. Also, the estimates of regional employment and income effects for each alternative allow an analysis of the relative efficiency of the alternatives for providing the regional jobs and income benefits sought through the Tongass timber sale program.

Employment

The action alternatives would generate approximately 350 jobs based on a ratio of 7.52 jobs per million board feet (4.88 direct jobs and 2.64 indirect jobs) (Newport, 1995). An assumption must be made about the annual rate of timber volume produced under each alternative in order to calculate the annual contribution of jobs by each alternative in this project; or one can make the employment comparison on the basis of the total jobs contribution of each alternative to regional employment. There are two reasons for using a comparison of total jobs generated. One is that the rates of production from the South Lindenberg project area will most likely be controlled by market factors rather than by the nature of a particular action alternative. The second reason is that the jobs referred to involve activities occurring over time. First there will be road construction, followed by logging and then by milling activities. Thus, while the actual logging may take only three years under an alternative, the elapsed time from the start of facility development until the last log goes through the mill may be four or more years. Table 4-33) displays employment impacts for each alternative for the entire period of sale area operations.

Table 4-33

South Lindenberg Contributions to Regional Employment During Entire Operation for Each Action Alternative (Number of Persons)

Nature of Jobs	Alt 2	Alt 3	Alt 4	Alt 5
Direct	231	226	225	224
Indirect	125	122	122	121
Total	356	348	347	345

Income

Based on an estimated $37,600 per job, each of the action alternatives would generate approximately $13 million in annual wage and salary income. This reflects updating the $33,000 per job in 1990 to 1995 for inflation by the Bureau of Labor Statistics Employment Cost Index. Table 4-34 shows the wage and salary income contribution by alternative.

Table 4-34

South Lindenberg Total Wage and Salary Contribution in Regional Personal Income During Entire Operation for Each Action Alternative

Alternative	Wages and Salaries
Alt 2	$13,385,600
Alt 3	$13,084,800
Alt 4	$13,047,200
Alt 5	$12,972,000

Gross National Product

The action alternatives would add between $31 million and $32 million to the GNP. GNP is the total value of the goods and services produced by the business activity of a region or nation. The best proxy for this value for the timber and wood products industry of Southeast Alaska is the estimated value of end products produced and sold during a period of time, or from a quantity of resources. The Forest Service appraisal procedure for the Tongass National Forest includes the collection of data on the value of the end products produced and sold from a thousand board-feet of log scale during recent periods of time. These data were used to compare the contributions to GNP for each alternative. These differ by alternative due to differences in the volume produced and the quality of the timber (species and log grades) estimated for each alternative. Table 4-35 shows the contribution to GNP for each of the alternatives for the South Lindenberg project.

Using an average contribution of about $680 per thousand board feet and the 1993-1994 average Tongass harvest volume of 300 million board feet, the average total contribution to GNP for the Tongass National Forest is $204,000,000 per year. Alternative 2, for example, if harvested over four years, would provide about 3.8 percent of the Tongass' annual contribution to GNP.

Table 4-35
South Lindenberg Contributions to Gross National Product During Entire Operation for Each Action Alternative

Alternative	Contributions to GNP (per MBF)[1]	Estimated Volume to Be Produced	Estimated End Product Value (per MBF)
Alt 2	$676	47,374	$32,024,800
Alt 3	$677	46,386	$31,403,300
Alt 4	$678	46,065	$31,232,000
Alt 5	$677	45,976	$31,125,700

[1]Total volume includes net sawlog, utility and road right-of way volume

Timber Sale Economics

An economic analysis has been made to provide a basis for comparison and ranking of the four alternatives proposed for the South Lindenberg analysis area in terms of production economics. In this analysis, the net value per MBF for each alternative is derived by subtracting all production costs, including an allowance for profit and risk, from the end-product selling values. In order to account for market fluctuations, this analysis uses "middle market" end product selling values. These values are the weighted average values for the past ten years, adjusted for inflation and an estimate of the timber quality found on the South Lindenberg area. Logging costs that were current at the time of the posting of the Notice of Intent for this sale are used. Because timber markets can vary significantly during a short time, the actual stumpage realized from this timber may change by as much as $100 per MBF or more.

Table 4-36 summarizes the timber values and costs calculated for each South Lindenberg alternative. Pond value is the middle market selling value of end-products (pulp, lumber, etc.), less manufacturing cost. Alternative 1, the no action alternative, is not shown since there is no harvest. The alternative volume shown includes utility volume and an estimate of the right-of-way volume that would be cut during road construction. The difference in net value between alternatives can be attributed to several factors as follows:

- the ratio of road construction to sale volume,
- differences in species composition, and
- differences in percentage of higher cost units to be selectively logged.

The middle market pond value of the logs shown in Table 4-36 are the result of averaging log values over a period of time selected to be "normal" for the markets for southeast Alaskan timber and wood products from the National Forests. These markets regularly experience rather wide fluctuations, and the general tendency has been for increases close to the rate of inflation plus some real price increases. Also, these values are the weighted average for all the sellers of wood products from National Forest timber sales. That is, they reflect the prices to the seller of average efficiency. Similarly, the costs for logging and processing the timber reflect the recent past experience of the operators of average efficiency. With that in mind, the results may be used in a comparative manner to evaluate the efficiency of the alternatives in providing timber supply to the regional economy.

The action alternatives indicate a negative mid-market net stumpage value ranging from minus $65 to minus $95 per MBF (Table 4-36). This indicates that each of the alternatives for this project area would need to be sold under higher than average market conditions in order to produce positive advertised stumpage above base rates. Alternative 5 has the least negative mid-market net stumpage value of minus $65 per MBF. This is attributable to

lower road construction costs associated with fewer miles of roads needed at less cost per mile. Alternative 3 has the largest negative mid-market net stumpage value of minus $95 per MBF. This is primarily due to the greater use of high cost helicopter logging systems and group selection prescriptions, and to more miles of road at a higher cost per mile. Alternative 2 has the lowest logging costs (excluding road construction costs), because of greater use of cable logging and clearcut harvests.

Table 4-36
South Lindenberg Mid-Market Timber Values and Costs to an Operator of Average Efficiency for Each Action Alternative

Alternative	2	3	4	5
Total Volume (MBF)[1]	47,374	46,386	46,065	45,976
Middle Market Pond Values ($/MBF)	$276	$280	$281	$279
Logging Costs $/MBF (Except Spec. Roads)	$238	$252	$257	$249
Specified Roads $/MBF	$58	$77	$72	$47
Subtotal Costs	$296	$330	$329	$296
Conversion Return	($19)	($49)	($48)	($17)
60% Normal Profit and Risk	$48	$46	$46	$48
Net Stumpage Value $/MBF[2]	($66)	($95)	($94)	($65)

[1] Total volume includes net sawlog, utility and road right-of way volume
[2] Numbers shown in parentheses are negative

Timber markets are historically volatile, and it is difficult to predict the future selling value of timber. However, recent timber market assessments (Morse, 1995) indicates that there is available capacity and strong market demand in Southeast Alaska. At the current time, both pulp and sawlog prices are high. Actual timber values are currently much higher than those used in the mid-market analysis (Table 4-36). The recent sale of the Bohemia Mountain Timber Sale showed current net timber values exceeded the mid-market net stumpage value by over $250. Due to the close geographical proximity and stand characteristics, the Bohemia Mountain Timber Sale was used as a comparison for a current market analysis (Thompson, 1996). The timber sale(s) proposed for this project will be sold at the minimum acceptable rates or higher when offered.

Table 4-37 summarizes the current market values for each South Lindenberg alternative. The current value was estimated by comparing the mid-market appraisal completed for the Bohemia Mountain EIS with net stumpage values for the Bohemia Mountain Timber Sale (Thompson, 1996). The alternative volume shown includes utility volume and an estimate of the right-of-way volume that would be cut during road construction.

Table 4-37
Estimate of Current Market Value by Alternative

	Alt.2	Alt.3	Alt.4	Alt.5
Total Volume (MBF)[1]	47,374	46,386	46,065	45,976
Current Net Value ($MBF)[2]	$189	$160	$161	$190
Current Total Net Value	$8,953,686	$7421,760	$7,416,465	$8,735,440

[1]Total volume includes net sawlog, utility, and right-of-way volume
[2]From Thompson, 1996

Transportation

The effects of the transportation system on other resources are considered in the specific resource sections (e.g., soil, watershed, fish, recreation, and wildlife). This section focuses on the effects of each alternative on the transportation system. The discussion is grouped into the following categories: (1) road development, (2) access management, (3) road development costs, (4) rock quarries, (5) road management objectives, (6) cumulative effects, (7) log transfer facility, (8) logging camp, and (9) sort yards.

Road Development

Table 4-38 displays the miles of new and existing roads by alternatives and by VCU. Road construction activities include vegetation clearing, excavation, installation of culverts and bridges, applying road base, and grading.

Pre-haul maintenance consists of rehabilitating existing roads for the resumption of log truck traffic, which would include grading of running surfaces, opening ditch lines, and cleaning of drainage structures (if needed). Alternatives 3 and 5 would use the most miles of existing road. Alternative 4 would have an intermediate level of existing road use. Alternative 2 would have the least amount of existing road use.

Table 4-38
Miles of New and Existing Roads by Action Alternative

	Alt. 2		Alt 3		Alt 4		Alt 5	
VCU	New	Existing	New	Existing	New	Existing	New	Existing
437	6.9	4.7	6.6	4.3	6.6	4.7	5.0	4.7
439	7.0	0.5	8.2	2.3	8.3	2.3	8.3	2.3
447	7.0	2.2	11.3	2.2	9.2	0.7	3.7	2.3
Total	20.9	7.4	26.1	8.8	24.1	7.7	17.0	9.3

Source: Forest Service, Stikine Area Data Base

New forest roads for the South Lindenberg EIS would be classified as either Forest Development Roads (FDRs) (otherwise referred to as "permanent roads") or temporary roads. FDRs are developed and operated for long-term land resource management purposes; these roads can receive constant or intermittent use depending on the timing of harvest. The FDRs form the primary transportation network in the project area, connecting geographically

distinctive areas within the project boundary to the Tonka Log Transfer Facility (LTF). These new roads would receive constant or intermittent use depending on the timing of harvest. After commercial use of these roads is complete, public use with highway vehicles would be discouraged, off-road vehicle use would be accepted, and hiking and bicycling would be encouraged. This would be accomplished by relying on advisory signs, by using trees and brush to camouflage the road entrance, by creating large ditches or "tank traps" at the entrance to the road, and by allowing alder to eventually close the road (10 to 15 years). Roads could be cleared and reopened in the future for resource management purposes. Among alternatives the level of new road construction effort will be least under Alternative 5, intermediate under Alternative 2, and the greatest under alternatives 3 and 4, because of the planned access into the Skogs Creek drainage (see maps in Appendix B).

Temporary spur roads are short-term roads built for limited resource activities, and these roads tend to be utilized on the basis of one-time use only, allowing use of lower road construction standards. Thus temporary roads are generally less costly to construct than FDRs. These roads provide short term access for specific purposes, usually timber removal, and would not be open to public use. Temporary roads are closed, water barred, and allowed to return to vegetation after the intended use.

Alternatives 2 and 5, would have the least amount of total proposed roads (Table 4-39), mainly because no access is planned into the Skogs Creek drainage. Alternative 4 would have an intermediate amount of total proposed road. Alternative 3 would have the most amount of total proposed road.

Table 4-39
Miles of FDRs and Temporary Roads by Action Alternative

	Alt. 2		Alt 3		Alt 4		Alt 5	
VCU	FDRs	Temp.	FDRs	Temp.	FDRs	Temp.	FDRs	Temp.
437	3.5	3.4	3.3	3.3	3.2	3.4	2.1	2.9
439	6.0	1.0	7.3	0.9	7.3	1.0	7.3	1.0
447	6.0	1.0	9.7	1.6	8.3	0.9	3.0	0.7
Total	15.5	5.4	20.3	5.8	18.8	5.3	12.4	4.6

Source: Field verified road from GIS data base

All action alternatives would propose development in the following unroaded areas.

- area north of Duncan Creek, and
- valley north of Road 6355 and west of the Tonka LTF.

The following roads are common to all road segments:

- Road 43500 to Unit 6,
- Road 43501 to Unit 35,
- Road 43503 to the end of Unit 16,
- Road 43504 to Unit 2,
- Road 43520 to Unit 106, and
- Road 43523 to Unit 66.

Alternative 2 proposes to:

- extend Road 6355 south to Unit 129,
- extend Road 43518 and detached segment of Road 6355 to Unit 136,
- construct Road 43521 to Unit 107, and
- extend Road 43527 to Unit 55.

Alternative 3 proposes to:

- extend Road 6355 to proposed temporary spur road leading to Unit 128,
- extend road 43527 to Unit 55,
- construct Road 43506 to Unit 39,
- construct Road 43521 to Unit 106, and
- construct Road 43520 to Unit 90.

Alternative 4 proposes to:

- extend Road 43527 to Unit 55,
- construct Road 43506 to Unit 39, and
- construct Road 43520 to Unit 90.

Alternative 5 proposes to:

- construct Road 43506 to Unit 39,
- construct Road 43521 to Unit 107,
- construct Road 43527 to Unit 55, and
- extend Road 6355 to temporary spur leading to Unit 128.

Access Management

Road access management to address resources objectives, resource concerns and public safety are described in the "Road Descriptions" section of this DEIS (Appendix B).

Road construction under each of the action alternatives are intended to receive basic custodial management (i.e., maintenance of drainage facilities and controlling of runoff patterns) after commercial use. Roads 43500, 43501, 43503, 43504, 43506, 43518, 43520, 43521, 43523, 43527, and 6355 would be allowed to be closed by alder growth, if roads are not used for a subsequent harvest entry or other permitted use (such as mining). Non-motorized uses such as bicycling or hiking would be encouraged. Off-road vehicles would be accepted, while use by low-clearance highway vehicles would be discouraged. This same strategy would be followed for existing roads 6353, 6354, 6355, and 6359.

Existing roads 6350, 6352 and 6360 would remain open for limited passage of traffic. These roads would be maintained to allow drainage structures to remain functional and to prevent unacceptable environmental damage. Off-highway and non-motorized uses would be encouraged. High clearance vehicles such as pick-up trucks would be accepted, while passenger vehicles would be discouraged.

Roads under Forest Service jurisdiction can be closed under the authority of CFR 36, Chapter 11, Parts 212.7 and 261. Road closure orders would be posted at the Petersburg Ranger District Office. Under the U.S. mining laws, a statutory right exists for miners to enter public lands to search for minerals, and access to mining claims will not be restricted. However, mine and prospectors would be required to obtain a road use permit.

Because of their limited purpose, temporary roads would be closed after use. These roads would not be part of the permanent transportation systems.

Road Development Costs

Road development costs by action alternatives are shown in Table 4-40. The road development cost would be the least for Alternative 5, followed by alternatives 2, 4, and 3 respectively. The ranking of the road construction costs are directly related to the length of roads required to develop each action alternative. Costs were based on Forest Service experience (USDA Forest Service, Method II, based on road field surveyed).

Table 4-40
Road Development Costs by Action Alternative

Alt.	FDRs	Temporary	Total
2	$2,471,419	$704,147	$3,175,566
3	$3,536,037	$861,724	$4,397,761
4	$3,272,701	$789,316	$4,062,017
5	$2,117,426	$676,160	$2,793,586

Source: Based on Method II, estimating for road construction.

Rock Quarry

Quarry (rock pit) locations are determined by the availability of suitable gravel or rock based material, by the quality and quantity of the source material, the visual resource considerations, hauling distances between the quarry locations, development costs, and the frequency of the road entry. Locations of existing and potential rock quarries are shown in the Transportation maps in Appendix B.

Some quarries are small and would only require one-time use. Some quarries near the end of roads with no potential for future road extension will be closed and reclaimed by spreading stockpiled overburden material on the floor of the quarry with or without hydro seeding of the overburdens. Suitable spoilage material from end hauling areas could also be used on the floor of the rock quarry.

Existing quarries would be expanded if suitable materials are available. These quarries would be located in centralized locations on roads with road extension potential.

Road Management Objectives

Road Management Objectives (RMOS) define the intended purposes of each road proposed for construction in this project. The RMOS prescription for each road is described in detail under the Road Description section in Appendix B.

Cumulative Effects of Road Construction

Each of the action alternatives would add to the existing road mileage within the project area. There are approximately 58.5 miles of existing roads in the South Lindenberg project area. The principal impacts from the construction, operation, and maintenance of roads revolve around erosion and potential impacts to watershed and fishery resources. These effects are described in the respective watershed, soil, and fisheries sections of the EIS. Other effects related to road development are also described in the subsistence, wildlife, TES plants, wetlands, and visual resource sections.

Road density is one indicator of the environmental impact of this project. Road density is defined as the number of miles of forest development road in a square mile of land. The higher the road densities, the greater the potential risk of adverse environmental impacts. These risks would be minimized by following the mitigation cited above.

Table 4-41 displays the amount of road acreage and the road densities for existing roads in the South Lindenberg project area, by VCU.

Table 4-42 displays the cumulative effects of the proposed timber sale roads with the existing road systems on the project areas.

Both alternatives 3 and 4 show the highest road densities with about 0.93 and mi/mi^2, respectively. Alternatives 2 and 5 follow with 0.81 and 0.83 mi/mi^2, respectively.

Table 4-41
Existing Road Miles, Road Acreage, and Road Densities by VCU

VCU	FDRs (mi)	Temp. Road(mi)	Total (mi)	Road Acreage	Density (mi/mi^2)
437	27.2	9.8	37.0	179.39	1.00
439	14.0	1.4	15.4	74.67	0.69
447	5.9	0.2	6.1	29.58	0.13

Source: Forest Service, Stikine Area Data Base.

Table 4-42
Existing and Proposed Road, Road Acreage, and Road Densities for Each Action Alternative

Alternative	Existing Road (mi)	Proposed Road (mi)	Total Road (mi)	Road Acreage	Density (mi/mi^2)
Alternative 1	58.5	0.0	58.5	284	0.64
Alternative 2	58.5	20.9	79.4	385	0.87
Alternative 3	58.5	26.1	84.6	410	0.93
Alternative 4	58.5	24.1	82.6	400	0.91
Alternative 5	58.5	17.0	75.5	366	0.83

Source: Forest Service, Stikine Area Data Base.

Log Transfer Facility (LTF)

The Tonka LTF, located on Wrangell Narrows, is the only log transfer facility in the project area and is the only one that is needed to implement the action alternatives. The Tonka LTF was constructed from 1978 to 1980 and was recently upgraded to an off-ramp type of facility in 1991. The current permits for this LTF are valid until the year 2003.

Logging Camps

The South Lindenberg EIS project area is easily accessible by boat from the City of Petersburg and Mitkof Island across the Wrangell Canal. No logging camp on Kupreanof Island would be necessary to implement any of the action alternatives.

Sort Yards

Primary sorting for logs for the dominate tree species and one or two of the most common log grades will be done at each landing. Potential locations for secondary sorting would include:

- the intersection of existing of Road 6350 and the proposed Road 43500, and
- existing sort yard located to the east of Unit 11 on Road 6350.

Mitigation

The following mitigations would address soil erosion impacts due to development of the transportation system for the South Lindenberg Timber Sale and would be implemented as part of all action alternatives:

- during planning and construction, select the proper size and, in some instances, oversized drainage structures;
- during construction, frequently use cross-drainage structures, especially on steep road grades;
- during logging operations, and after logging and hauling have been completed, inspect culverts so they are free-flowing and free of debris;
- during construction, armor both the inlet and outlet of culverts with the proper size rocks and locate drainage structures in the proper place;
- during construction, employ grass seeding and/or mulching of all cut banks and fill slopes;
- during construction, limit operations to outside of the salmonid egg incubation periods and outside of the winter season;
- during construction, build proper size ditch lines and maintain them; and
- following logging operation, close temporary roads by removing culverts, installing water bars, and allowing alder to grow on the road bed.

Other Environmental Considerations

Unavoidable Adverse Impacts

To the maximum extent possible, impacts from action alternatives were reduced by avoiding harvest in areas where the impacts would be the greatest. An interdisciplinary procedure (integrating comments and concerns from many resource specialists) and scoping comments from resource agencies and the public were used to select the location and extent of harvest units and roads. In addition, the application of Forest Plan Standards and Guidelines, BMPs, mitigative measures, and monitoring plans are intended to further limit the extent, severity, and duration of anticipated impacts. Some adverse impacts to the environment nevertheless cannot be avoided or mitigated. These impacts may be either transitory, short-term, or long-term in duration, and are described below.

Transitory impacts are expected to occur during the time of construction activity only. For example, noise and diminished air quality could occur on a temporary basis due to road construction, timber harvest, and timber hauling. These activities would have localized and temporary adverse effects. Short-term impacts generally occur during construction and harvest but may also extend to a few years following construction.

Most unavoidable adverse impacts are long-term, occurring for many years. One of the most significant adverse impact that affects many resources is the loss of old-growth forest. This vegetation alteration results in changes to wildlife species richness and abundance wherever harvesting occurs. Species dependent on old-growth would no longer utilize areas harvested. A return to old-growth characteristics would require a minimum of 100 years, and would not occur on forest tracts set aside for rotational harvests. Effects on biodiversity are difficult to quantify. These types of impacts are best understood and treated on a landscape basis, and thus would become most apparent only after effects are cumulative over several harvest entries.

Harvesting also results in increased water temperatures wherever vegetation that shades streams is removed. Because Class I and II streams would have vegetated buffers of 100 feet, stream temperature increases are generally confined to Class III streams and areas where Class III streams flow into Class I or II streams. Both temporary and permanent losses of wetland vegetation would occur in the areas where roads are constructed. Temporary and minimal losses would occur in construction staging areas and permanent losses of wetland vegetation would occur where fill is placed in wetlands to form the road foundations. Increased sediment loading is expected in wetlands located in, or directly below, harvest units, and in wetlands through which roads are constructed.

The combined effects of timber harvest and road construction on ground disturbance often result in erosion and sediment production. Sediment production would occur from timber harvest and construction and use of roads. Sediment would be produced by surface erosion, channel erosion, and mass movement. Sediment loads in streams displace fish, reduce anadromous and resident fish reproductive success, and alter aquatic invertebrate populations.

Visual resources are also affected by harvesting, road construction, and rock extraction. These activities would create new visual contrasts of form, line, color, and texture in the South Lindenberg area. Visual contrasts would be experienced by visitors in the short-term, especially along Wrangell Narrows, although over time the visual contrasts would diminish as the overstory matures and blends into the surrounding landscape.

Increased public access through road construction affects subsistence, fisheries, and recreation. Competition for subsistence resources and increased angling pressure would occur indirectly from road construction, as roaded areas replace roadless areas. Implementation of action alternatives would reduce the amount of semi-primitive non-motorized recreation by up to one-half, and replace it with roaded modified recreation.

Relationship Between Short-Term Uses and Long-Term Productivity

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1960, which requires the Forest Service to manage National Forest lands for multiple uses, including timber, recreation, fish and wildlife, range, and watershed. All renewable resources are to be managed such that they are available for future generations. The harvesting and use of standing timber is considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grow again if the productivity of the land is not impaired.

Timber harvest results in the creation of new timber stands and increased growth rates. Old-growth forests are characterized by low or no net growth, with annual growth being offset by mortality (Hutchison and Lebau, 1975). The replacement of young, second-growth stands could double the volume growth produced over a 100-year-old rotation on an average site (Taylor, 1934). In areas that would be precommercially thinned, the amount of usable fiber available for industrial use would be increased. Under current and proposed management direction, the time between the harvest proposed for the South Lindenberg EIS and a subsequent harvest on the same area is estimated at approximately 100 years. After 100 years, these cut stands would be considered for another harvest. Long-term productivity is not expected to be affected from repeated harvest cuts on 100-year rotations.

The harvesting of forest land is a trade-off between the immediate, short-term extraction and use of timber and long-term biodiversity of unharvested old-growth forest. Because there is a relatively small proportion of the landscape that is subject to proposed harvesting in the South Lindenberg area, only a correspondingly small loss of long-term biodiversity would be associated with the short-term extraction of timber from the South Lindenberg Timber Sale alone. These trade-offs are primarily significant when the cumulative effects of several harvest entries into the South Lindenberg and surrounding areas result in substantially more fragmentation of old-growth habitat. Cumulative effects of previous harvest and the

proposed South Lindenberg Timber Sale on old-growth habitat could approach significant levels and would represent a long-term loss of biodiveristy.

Harvest of old-growth forests for timber production precludes the maintenance of healthy populations of old-growth-dependent wildlife, and creates forests where wildlife is more susceptible to extirpation. Healthy populations of wildlife in the Lindenberg Peninsula have long-term value for hunting, trapping, and tourism, in addition to their intrinsic biodiversity value. Under a 100-year rotation, there would be a permanent loss of habitat capability for all old-growth dependent wildlife species. Stands that are converted from high-volume old-growth forest to even-aged stands would be lost as usable habitat for the Queen Charlotte goshawk and the marbled murrelet.

Short-term use could result in sediment and temperature related impacts to streams. Revegetation of harvest areas over time should significantly reduce these impacts so that long-term productivity is unaffected. Permanent roads would continue to contribute some sediment over time, and could have a small impact on long-term productivity of fish resources. All alternatives would provide the fish and wildlife habitat necessary to maintain existing known populations of native and nonnative species throughout the South Lindenberg area.

Subsistence resources would be affected in the short-term through increased noise and activity, loss or alteration of wildlife habitat, and possibly through siltation in fish-bearing streams. Revegetation of harvested areas and the completion of logging activities should reduce many of these effects. Loss of old-growth timber and establishment of a 100-year harvest rotation is expected to permanently decrease the availability of winter deer habitat, and consequently the deer available for hunting. Permanent roads will improve access to hunting areas, which could result in a long-term increase in competition for subsistence resources.

In the short-term, recreation experiences in the study area would be directly affected by the sights and sounds associated with road construction and timber harvesting. This would include the sounds of chain saws and the presence of logging trucks, yarders, loaders, and helicopters. In the long-term, as the harvest units revegetate and the effects of road construction soften, the modification of the landscape will become less evident. Roaded-modified recreation opportunities would be replaced with semi-primitive opportunities. The presence of permanent roads would contribute to long-term public access into previously inaccessible areas for recreation.

Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are decisions to use, modify, or otherwise affect nonrenewable resources such as cultural resources or minerals. Irreversible commitments could also apply to resources that are renewable only over a long period of time, such as soil productivity or old-growth forests. Such commitments of resources are considered irreversible because the resource is depleted to the point that renewal occurs only over a long period of time or at a great expense, or the resource has been destroyed or removed. All action alternatives result in some irreversible commitments, although the extent and potential for adverse effects increases with higher harvest volume and road mileage.

A proposed timber harvest is a major, long-term commitment of natural resources such as wildlife habitat. This commitment usually extends well beyond the typical land-use planning time-frame. Harvesting of old-growth timber is considered an irreversible loss, because stands may take 200 years or more to return to old-growth conditions. Under the proposed 100-year harvest rotation, stands that are converted from high-volume old-growth forest to even-aged stands would be lost as usable wildlife habitat for old-growth dependent species such as marten and Sitka black-tailed deer. Permanent road construction would also result in irreversible loss of wildlife habitat.

Irreversible disturbance of some types of cultural resources may occur as a consequence of management activities, although the probability of this occurring with the South Lindenberg Timber Sale is considered very low. This would be especially true for subsurface resources that cannot be located through surface surveys. Even with mitigation, unanticipated or unavoidable disturbances can result in the loss of cultural values.

The use of fossil fuels and the extraction of minerals are irreversible commitments of resources. The utilization of rock resources for road and facility construction would be an example. The use of fossil fuels during project administration activities would be an irreversible resource commitment. Alternatives vary by the amount of energy and mineral resources used; only the no action alternative avoids all use of these nonrenewable resources. Soil productivity would be eliminated in landings and rockpits.

In unroaded areas, development activities such as timber harvest and road construction would irreversibly reduce the area that could be designated under the National Wilderness Preservation System, the Wild and Scenic River System, as a Research Natural Area, or managed for other purposes requiring natural characteristics.

Permanent road construction would result in irreversible loss of wetland area. Harvesting in mixed forest-muskeg wetlands would result in the loss of sphagnum cover which can take over 200 years after a disturbance to begin to re-colonize forested areas. Harvesting of timber also changes the hydrologic regime of a watershed. The hydrology of the South Lindenberg study area would change due to the removal of hydrologically mature vegetation. Regardless of the mitigation measures, there would be some level of stream or groundwater response due to vegetation removal.

Possible Conflicts with Plans and Policies of Other Jurisdictions

The regulations for implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of federal, state, and local land use plans, policies, and controls for the area. The major land use regulations of concern are the Coastal Zone Management Act (CZMA), Section 810 of ANILCA, the Federal Clean Water Act, a Memorandum of Understanding between the USDA Forest Service and the US Fish and Wildlife Service, state air pollution standards, and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This law, as amended, requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that the activities or developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for a determination of consistency for activities within the coastal zone.

Forest Service requirements for consistency are detailed in a Memorandum of Understanding between the State of Alaska and the Regional Forester, dated October 8, 1981. Standards against which the consistency evaluation will take place are: Alaska Statute Title 46, Water, Air Energy, and Environmental Conservation; Alaska Forest Practices Act of 1990; and the District Coastal Management Program.

Minerals

There are no known conflicts associated with plans or policies related to minerals within the South Lindenberg area.

Subsistence

The actions proposed in this document have been examined to determine whether they are consistent with sound management of public lands, as required in Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA). While actions from the South Lindenberg Timber Sale may have significant impacts on subsistence resources, some impacts of timber harvest were foreseen in enacting laws governing resource management in Southeast Alaska. Conflicts between subsistence resources and timber harvest have been considered in the following documents: (1) National Forest Management Act, (2) Tongass Land Management Plan, (3) Tongass Timber Reform Act, and (4) Alaska National Interest Lands Conservation Act. The foreseeable benefits of the South Lindenberg Timber Sale have been weighed against the environmental effects on subsistence resources and in aggregate are consistent with the legislative direction implied in the above laws and plans.

Memorandum of Understanding on TES

The aim of the Memorandum of Understanding signed by the USDA Forest Service in 1994 was to provide for management guidelines now to prevent the future listing of candidate species as endangered or threatened. The WRA strategy and the protection of the Skogs Creek watershed provide for the potentially-permanent retention of large, unfragmented old-growth blocks. Intrusion of harvest activities into these areas might limit the capacity for the Lindenberg Peninsula to sustain populations of old-growth-dependent species such as Queen Charlotte goshawk, marbled murrelet, and Alexander Archipelago wolf. These limitations, when considered in conjunction with other potential management actions on Kupreanof Island, may affect the sustainability of the island's wildlife populations.

Cultural Resources

Federal legislation for the protection of cultural resources on public land requires consultation with the State Historic Preservation Officer when federally funded or licensed undertakings have the potential to affect cultural resources. The objective of the Forest Service Heritage Program is to preserve significant cultural resources in their field setting and ensure that they remain available in the future for research, educational, social, and recreational purposes. To this end, adequate standards, guidelines, and procedures to protect cultural resources and meet the goals of the Heritage Program have been adopted.

Recreation

None of the alternatives conflict with the plans, policies, or objectives of other jurisdictions for recreation.

Visual Resources

There are no anticipated conflicts with the plans, policies, and objectives of other jurisdictions regarding visual resources.

Clean Water Act

Federal Clean Water Act of 1972, as amended in 1977 and the MOA signed between the Forest Service and the Alaska Department of Environmental Conservation require the Forest Service to comply with all federal and state water quality regulations. This act provides a means to protect and improve the quality of the water resources and maintain their beneficial uses. All alternatives will comply with these standards.

Air Quality Standards

The South Lindenberg area is governed by ambient particulate standards of 60 $\mu g/m^3$ (24-hr). Additionally, the region is classified as a Class II area, which establishes a particulate matter increment for allowable increases above baseline levels. The increments for particulate matter in a Class II area are in annual geometric mean of 19 $\mu g/m^3$. The South Lindenberg vicinity is presently in compliance with these standards. The proposed logging activity will not change this status.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, Governor Cowper approved a major revision of the State's Forest Practices Act (FPA). The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act also affects National Forest management through its relationship to the Alaska Coastal Management Program (ACMP) and the Federal CZMA (see above discussion).

For National Forest timber operations, such as proposed for the South Lindenberg area, the effect of the revised Forest Practices Act is essentially two-fold. First, it clarifies that the revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency to the maximum extent practicable with the Alaska Coastal Zone Management Program. Secondly, it calls for minimum 100-foot buffers on all Class I streams. The revised Forest Practices Act recognizes that consistency to the maximum extent possible for purposes of the Alaska Coastal Management Program is attainable in Federal timber harvest activities using specific methodologies which may differ from those required by the revised Forest Practices Act or its implementing regulations.

The TTRA prohibited commercial timber harvesting within buffer zones established on all Class I streams and those Class II streams which flow directly into a Class I stream. Buffer zones have a minimum width of 100-feet slope distance from the edge of either side of the stream. In addition, the Forest Service is currently working with the Alaska State Division of Government Coordination on a revision of the MOU between the State and the Forest Service. This revised MOU will establish the policies and procedures for coordinating State review of Forest Service programs and activities, including those covered by the Forest Practices Act and the Alaska Coastal Management Program.

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Glossary & List of Acronyms

Glossary

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. In section 705(a) Congress directed that at least $40,000,000 be made available annually to the Tongass Timber Supply Fund to maintain the timber supply from the Tongass National Forest at a rate of 4.5 billion board feet per decade. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)
Enacted December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

Allowable Sale Quantity (ASQ)
ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity expressed as a board foot measure is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

Anadromous Fish
Anadromous fish (such as salmon, steelhead, and shad) spend part of their lives in fresh water and part of their lives in salt water.

Anaerobic Conditions
Conditions under which oxygen is absent from the environment.

Aquatic Habitat
Includes any region of open-water potentially utilized by animal species, such as bogs, creeks, streams, rivers, ponds, lakes, estuaries, or marine waters.

Aquatic Habitat Management Unit (AHMU)
A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy.

> *Class I AHMU:* Streams with anadromous or high quality sport fish habitat. Also included is the habitat upstream from a migration barrier known to have reasonable enhancement opportunities for anadromous fish. Often referred to as Class I streams.

Class II AHMU: Streams with resident fish populations and generally steep (6 to 15 percent) gradient (can also include streams from 0 to 6 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values and are separate from the high quality sport fishing systems included in Class I. They generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use. Often referred to as Class II streams.

Class III AHMU: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat. Often referred to as Class III streams.

Archaeological Resources Protection Act
1979 legislation requiring a permit for any excavation or removal of archeological resources from public or Indian lands. The act provides both civil and criminal penalties for violation of permit requirements

Arterial Road
A forest road that provides service to large land areas and usually connects with other arterial roads or public highways.

Artifact
Any object made, modified, or used by man. Anything that exhibits physical attributes assumed to be the result of human activity.

Beach Fringe Habitat
Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres.

Best Management Practice (BMP)
A practice or combination of practices that, after problem assessment, examination of alternative practices, and appropriate public participation is determined to be the most effective and practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. A BMP is not a site-specific prescription but an action-initiating mechanism which eventually leads to the interdisciplinary development of a site-specific prescription.

Biodiversity
A concept applied to a given area or region that includes the variety of and variability among living organisms and the ecological complexes in which they occur. In Southeast Alaska, biodiversity is most often associated with the array of species dependent on old-growth forest habitat.

Bog
Wetlands dominated by sphagnum moss whose only water source is rainwater. Bogs are generally extremely low in nutrients, form acidic peats, and occur in northern latitudes.

Carrying Capacity
The theoretical population size of a particular species that a defined area could support.

Class I, II, III Streams
See Aquatic Habitat Management Unit

Clearcutting
A method of regeneration cutting in which the old crop is completely cut in designated patches. Regeneration in the Alaska Region is usually natural; and the size of the clearcut area rarely exceeds 100 acres.

Collector Road
A forest road that serves smaller land areas than an arterial road. Usually connects forest arterial roads to forest local roads or terminal facilities. Collector roads are usually long term facilities.

Commercial Fishery
Fish, shellfish, or other fishery resources taken or possessed within a designated area for commercial purposes.

Commercial Forest Land (CFL)
Forest land that is producing or capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Cultural Chronology
The historic and spatial framework for describing the development of human societies and cultures, and the documented processes of cultural change involved in this development.

Cultural Resource Sensitivity Zones
Areas determined by a Tongass National Forest predictive model to have high, medium, and low site potential, based largely on elevation and slope angle criteria.

Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, and so on that result from past human activities.

Culturally Modified Tree (CMT)
A tree which has been intentionally altered by Native people participating in the traditional utilization of the forest.

Cumulative Effects
Impacts on the environment resulting from past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

Direct Jobs
The jobs that are immediately associated with the Long-Term Contract timber sale including for example logging sawmills and pulp mills.

Directional Falling
The use of specialized equipment, such as hydraulic jacks, to influence the direction of tree falling.

Draft Environmental Impact Statement
Section 102 of the National Environmental Policy Act (NEPA) requires that a statement of environmental effects for a major Federal action be released to the public and other agencies for comment and review prior to a final management decision.

Ecosystem
A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake).

Endangered Species Act of 1973
The legislation establishing regulatory protocols and protection for species recognized by the federal government as threatened or endangered.

Environmental Assessment
The process, formalized in production of Draft and Final Environmental Impact Statements, of evaluating the existing conditions (for multiple resource categories) of a proposed project site, and the anticipated changes to that site arising from proposed management alternatives.

Estuary Fringe Habitat
A 1,000-foot zone around an estuary.

Estuary
For the purpose of this EIS process, estuary refers to the relative flat intertidal and adjacent upland areas generally found at the heads of bays and mouths of streams. They are predominantly mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-Aged Management
The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Clearcutting is an example of this type of management.

Existing Visual Condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:

> ***Type I:*** These areas appear to be untouched by human activities.
>
> ***Type II:*** Areas in which changes in the landscape are not noticed by the average person unless pointed out.
>
> ***Type III:*** Areas in which changes in the landscape are noticed by the average person but they do not attract attention. The natural appearance of the landscape still remains dominant.
>
> ***Type IV:*** Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. Although the change in landscape is noticeable, it may resemble a natural disturbance.
>
> ***Type V:*** Areas in which changes in the landscape are obvious to the average person. These changes appear to be major disturbances.
>
> ***Type VI:*** Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be drastic disturbances.

Feature
A non-portable cultural element of a site that is not classed as an individual artifact. Often a distinct association of cultural elements.

Fish Habitat
The aquatic environment and the immediately surrounding terrestrial environment that combined afford the necessary physical and biological support systems required by fish species during various life stages.

Floodplain
The lowland and relatively flat areas along inland and coastal waters, including debris cones and flood-prone areas of offshore islands; including at a minimum that area subject to a 1 percent (100-year recurrence) or greater change of flooding in any given year.

Forest and Rangeland Renewable Resources Planning Act of 1974
Amended in 1976 by the National Forest Management Act.

Forested Habitat
All areas with forest cover. Used in this EIS to represent a general habitat zone.

Full Bench Road Construction
Typically the side of a hill is partially cut and partially filled to accommodate a road. When the entire width of a road is cut into a hillside, and material is hauled away, this is a full bench road. Full bench road construction is typically done in situations of steep slopes and/or unstable soils.

Fragmentation
The breaking up of large areas of old-growth forest by clearcutting. As the number of clearcut harvest units within a contiguous block of forest increases, the block of forest is reduced in size and/or broken into smaller blocks. This kind of fragmentation is known to have a detrimental effect on several old-growth dependent wildlife species.

Geographic Information System (GIS)
An information processing technology to input, store, manipulate, analyze, display spatial, and attribute data to support the decision making process. It is a system of computer maps with corresponding site specific information that can be electronically combined to provide reports and maps.

Green Tree
A living tree, retained in a clearcut, to provide potential wildlife habitat (in the form of a perching, nesting, roosting, or feeding site), as well as providing potential snag material in the future. Also contributes to softening of visual effects of clearcutting.

Gross National Product
The total value of goods and services by the business activity of a region or nation.

Group Selection
Removal of groups of trees, creating openings large enough (1/2 - 3 acres) for adequate regeneration of a selected species.

Habitat Capability Model
Computer-based estimate of habitat suitability based on a quantified characterization of the particular habitat requirements for a species combined with a quantified characterization of conditions within a region.

Habitat Capability
The number of healthy animals that a habitat can sustain.

Habitat Conservation Area (HCA)
A patch of habitat that is maintained in largely natural condition to maintain viable populations of a particular species or group of similar species. It is usually part of a larger network of HCAs that facilitate movement of individuals among populations.

Glossary and Acronyms

Habitat Suitability and Habitat Suitability Index (HSI)
A computer-generated mathematical prediction of the relative ability of a defined region to support a particular species whose habitat requirements are known and codified within a habitat capability model. The suitability index (HSI) ranges from 0 to 1, with 0 meaning that the habitat is incapable of supporting the particular species, and HSI=1 indicating that the habitat is optimal for the species. An intermediate index reflects the potential for the habitat to support a proportion of the individuals that could be sustained under optimal conditions. For the South Lindenberg EIS, habitat suitability is defined in four categories: suitable ($0.7<HSI\leq 1$); marginal ($0.3<HSI\leq 0.7$); unfavorable ($0<HSI\leq 0.3$); and unsuitable (HSI=0).

Herpetological Species
A collective name referring to amphibian and reptilian wildlife species.

Humics

Dark organic substances of indefinite composition that commonly occur in waters of streams, lakes, and wetlands where surrounding soils are rich in organic matter.

Hydric Soils
A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Indirect Jobs
The jobs in service industries that are associated with the Long-Term Contract timber sale including for example suppliers of logging and milling equipment.

Interdisciplinary Team (IDT)
A group of people with different professional backgrounds assembled to solve a problem or perform a task.

Knutsen-Vandenberg Act (KV)
The Act was passed by Congress in 1930 and amended in 1976 to provide for reforestation, resource protection, and improvement projects in timber sale areas. These funds are collected as a portion of the stumpage fee paid by the purchaser. Examples of such projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

Land Use designation (LUD)
The method of classifying land uses presented in the Tongass Land Management Plan (TLMP). Land uses and activities are grouped to define a compatible combination of management activities along with a set of coordinating policies. The following is a description of the four classifications under the TLMP now in place (USDA Forest Service, 1979; 1985-86):

> *LUD:* Wilderness areas.
>
> *LUD II:* These lands are to be managed in a roadless state in order to retain their wildland character, but this designation would permit wildlife and fish habitat improvement as well as primitive recreation facility and road development under special authorization.
>
> *LUD III:* These lands may be managed for a variety of uses. The emphasis is on management for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.
>
> *LUD IV:* These lands provide opportunities for intensive resource use and development where the emphasis is primarily on commodity or market resources.

Large Woody Debris (LWD)
Any large piece of relatively stable woody material having a diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel or occurs on the forest floor.

Layout
Planning and mapping (using aerial photos) of harvest and road systems needed for total harvest of a given area.

Logging Systems

> ***Skidder:*** A system of log transportation in which logs are pulled from the woods to a landing by means of a crawler tractor, skidder, or similar ground-based equipment.
>
> ***High-lead:*** A system of cable logging in which the working lines are elevated at the landing area by a rigged wooden tree or portable steel spar.
>
> ***Skyline:*** A system of cable logging in which all or part of the weight of the logs is supported during yarding by a suspended cable.
>
> ***Helicopter:*** A system of transporting logs from the woods to a landing as an external load on a helicopter.

Log Transfer Facility (LTF)
A facility that is used for transferring logs from land to water. It is wholly or partially constructed in waters of the United States and siting and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed terminal transfer facility.

Mammal Sign
Any indirect evidence of mammalian activity as opposed to direct, visual observation of an organism. Examples include scat (feces), scratchings, tracks, and evidence of feeding.

Management Area (MA)
Adjacent VCUs (see VCU) that have common management direction.

Management Indicator Species (MIS)
The following categories were used where appropriate: endangered and threatened plant and animal species identified on State and Federal lists; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; additional plant or animal selected because their population changes are believed to indicate effects of management activities on other species of a major biological community or on water quality.

Marginal Habitat
See Habitat Suitability

Microblade
A specific type of small, thin blade tool with roughly parallel sides and a prepared proximal end. Often made from chert or obsidian.

Midden
A deposit of occupation debris, rubbish, or other by-products of human activity.

Million Board Feet (MMBF)
Board feet is a unit of timber measurement. One board foot equals the amount of wood contained in an unfinished board that is one inch thick, 12 inches long, and 12 inches wide.

Mitigation
These measures include avoiding an impact by not taking a certain action or part of an action, minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Muskeg
A bog, often dominated by sphagnum moss, frequently with deep accumulations of organic material, occurring in wet, poorly drained boreal regions.

National Environmental Policy Act (NEPA)
Passed by congress in 1969, NEPA declared a national policy to encourage a productive harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality. This act requires the preparation of environmental impact statements for federal actions that are determined to be of major significance.

National Forest Management Act (NFMA)
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Forest plans.

National Historic Preservation Act
1966 legislation establishing the National Register of Historic Places and extending the national historic preservation programs to properties of state and local significance.

National Register of Historic Places
Official federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering and culture.

National Wild and Scenic River System
Rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition.

Net Sawlog Volume
Volume of wood-fiber of suitable size and quantity that can be processed into lumber.

Non-Commercial Species
Species that have no economic value at the present time and no anticipated timber value within the near future.

Nonforest Habitat
Land that has never supported forests, land formerly forested but now developed for nonforest uses, or land with less than 10 percent cover of commercial tree species.

Notice of Intent (NOI)
Notice of Intent was submitted to indicate an intention to produce this EIS.

Old-Growth Forest
Old-growth stands are characterized by trees well past the age of maturity (dominant trees typically exceed 300 years in age). Stands exhibit declining growth rates and signs of decadence such as dead and dying trees snags and downed woody material. Stands include trees of all ages, multilayered canopies, a range of tree diameter sizes (including very large diameter trees up to and exceeding 3 meters), and the notable presence of understory

vegetation. Old growth stands are defined in the TLMP inventory as those stands having the majority of timber volume in trees more than 150 years of age.

Optimal Habitat
See Habitat Suitability

Overmature
The stage at which a tree declines in vigor and soundness, for example, height growth has usually stopped and probability of mortality is high.

Overstory
In a stand with several vegetative layers the overstory is the uppermost layer usually formed by the tallest trees.

Parent Material
The unconsolidated, and more or less chemically weathered, mineral, or organic matter from which soils develop.

> ***Residuum:*** parent material developed in place.
>
> ***Colluvium:*** parent material derived from debris deposited by gravity.
>
> ***Glacial Deposits:*** parent material created as a result of glacial action.

Partial Cutting
Any cutting other than a clearcut. This may include thinning, selection, shelterwood, or an overstory removal.

Petroglyph
Any drawing or picture incised or pecked on a rock. Often highly stylized or geometric in nature.

Pond Value
The selling value of timber without the manufacturing cost.

Precommercial Thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Purchaser
The term used to describe the buyer of the Forest Service Timber Sale Contract.

Recreation Opportunity Spectrum (ROS)
The framework for planning and managing the recreation resource that consists of six classes from primitive to urban. Each ROS class is defined in terms of its setting and the recreational experiences offered in that setting. Other factors also play a role in defining the ROS class, including the extent to which the natural environment has been modified, the type of facilities developed, and the degree of outdoor skills needed to enjoy the area.

> ***Primitive I:*** Includes areas out of sight and sound of human activities and greater than 3 miles from roads open to public travel and marine travelways. Provides opportunities having a high degree of interaction with the natural environment, challenge risk, and the use of outdoor skills.
>
> ***Primitive II:*** Area is similar in appearance to Primitive I ROS class; however, is accessible by marine travelway or is within 1/4 mile of low use trails.

Semi-Primitive Nonmotorized: Includes areas greater than 1/4 mile and less than 3 miles from all roads trails or readily accessible marine travelways. Provides limited opportunities for isolation from the sights and sounds of humans, a high degree of interaction with the natural environment, moderate challenge risk, and the opportunity to use outdoor skills.

Semi-Primitive Motorized: Includes areas less than 1/4 mile from primitive roads, trail, or readily accessible marine travelways. Characterized by a predominantly unmodified natural environment with minimum evidence of sights and sounds of humans. Road access is not maintained in these areas.

Roaded Natural: Areas are less than 1/4 mile from roads open to public travel, major power lines, and areas of timber harvest. Areas are characterized by predominantly natural environments with moderate evidence of sights and sounds of humans.

Roaded Modified: Areas are less than 1/4 mile from areas of timber harvest and transportation corridors. Areas are characterized by modified natural environment where utilization practices are common and are for purposes other than recreation.

Rural: Includes those areas with small communities, developed campgrounds, and administrative sites. These areas are characterized by substantially modified natural environments. Sights and sounds of humans are readily evident.

Urban: Areas characterized by substantially urbanized environment. The background may have elements of a natural environment. Timber harvest activities and utilization practices are common. Sights and sounds of humans predominant. Large numbers of visitors can be expected on site and in nearby areas.

Recreation Places
Identified geographic areas having one or more physical characteristics that are particularly attractive to people engaging in recreation activities. They may be beaches, streamside or roadside areas, trail corridors, hunting areas of the immediate area surrounding a lake, cabin site, or campground.

Recreation Sites
Specific locations used for recreational activities such as a specific anchorage, campsite, or trail. There may be one or more recreation sites within a recreation place.

Resident Fish
Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish in the South Lindenberg area include non-anadromous Dolly Varden char and cutthroat trout.

Retention Goals
Plans for maintaining unaltered habitat within a managed region (USDA Forest Service, 1984a).

Riparian Zone
Areas immediately adjacent to a body of water, the vegetation of which is usually influenced by the water.

Roads, Specified
A road including related transportation facilities and appurtenances shown on the Sale Area Map and listed in the Timber Sale Contract.

Roads, Temporary
For National Forest timber sales temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network and have stream crossing structures removed, erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Rotation
The planned number of years between the formation or the regeneration of a crop or stand of trees and its final cutting at a specified stage of maturity.

Rotation Age
The age of a stand when harvested at the end of a rotation.

Sawlog (saw timber)
That portion of a tree that is suitable in size and quality for the production of dimension lumber collectively known as saw timber.

Second-Growth Forest
Even-aged stands that will grow back on a site after removal of the previous timber stand.

Sedimentation
Addition of fine organic or inorganic matter to a stream channel. Usually that portion remaining in the stream bed channel.

Sensitivity Level
The measure of people's concern for scenic quality. In 1980 the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages, plane routes, roads, trails, public use areas, and recreation cabins.

> *Level 1:* Includes all seen areas from primary travel routes, use areas, and water bodies where at least three-fourths of the forest visitors have a major concern for scenic quality.
>
> *Level 2:* Includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the forest visitors have a major concern for scenic quality.
>
> *Level 3:* Includes all seen areas from secondary travel routes, use areas, and water bodies where less than one-fourth of the forest visitors have a major concern for scenic quality.

Seral-Stage
See Succession

Shade Tolerance
The relative ability of a tree to survive under the shade of adjacent trees.

Silvicultural System
A management process whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the process (see group selection, even-aged management, uneven-aged management, and clearcutting.)

Silvicultural Treatments
Forest management practices that deal with the establishment, development, reproduction, and care of forest trees.

Site
In archeology, the locus of any surviving physical evidence of past human activity, including the record of the effect of the activity on the environment.

Site Index
A measure of the relative productive capacity of an area for growing wood. Measurement of site index is based on height of the dominant trees in a stand at a given age.

Slash
Debris left after a logging operation (i.e., limbs, bark, broken pieces of logs).

Snag
A standing dead tree, often utilized by varied wildlife species as a roosting, perching, or feeding site, as well as providing potential habitat for species such as those that nest inside excavated cavities.

Species Richness
A term, or quantitative index, evaluating the diversity of species present in an area.

Stand
An aggregation of trees or other growth occupying a specific area and sufficiently uniform in composition (species), age, arrangement, and conditions as to be distinguishable from the forest or other vegetation on adjoining areas.

State Historic Preservation Officer (SHPO)
The official designated by the Governor to administer the State's historic preservation program and the duties described in 36 CFR Part 61 including nominating properties to the National Register.

Stream Buffer
Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet in width on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a buffer.

Subalpine/Alpine Habitat
In Southeast Alaska, the region found on a mountain peak above 1,500-foot elevation. Vegetation is typically characterized by transitions from closed to patchy forest to open shrubs and herbaceous plants.

Subsistence Use
The customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing, for personal or family consumption; and for customary trade.

Succession
A series of changes affecting the development of a biotic community. In forested areas, the community will pass through several vegetative stages on its path to a climax stage.

Tentatively Suitable Forest Land
Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Thousand Board Foot Measure
A method of timber measurement in which the unit is equivalent to 1,000 square feet of lumber one inch thick. It can be abbreviated Mbd, Mbm, or MBF.

Threatened, Endangered, and Sensitive (TES) Plants
Plant species that are considered threatened, endangered, or are sensitive to extinction. In addition to those species listed by the USFWS as Threatened, Endangered, or candidates for listing, TES species include those considered regionally rare by the Forest Service or the Alaska Natural Heritage Program.

Timber Entry
A term used to refer to how far an area is into the timber rotation based on the proportion of acreage harvested. For example, if an area is being managed for 3 entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30-40 years); the second entry would be completed when two-thirds (approximately 66 percent of the available acreage is harvested (usually 60-70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Tongass Forest Plan Revision
The re-evaluation of the Tongass Land Management Plan, most recently updated in USDA Forest Service (1991d).

Tongass Land Management Plan (TLMP)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the forest. See also Land Use Designation.

Tongass Resource Use Cooperative Survey (TRUCS)
A compilation of data on subsistence uses for evaluating the effects of the Forest Service's action contemplated in the revision of the regional Tongass Land Management Plan.

Tongass Timber Reform Act (TTRA)
An act requiring annual appropriations for timber management on the Tongass National Forest, with a provision providing for the multiple use and sustained yield of all renewable forest resources.

Understory
Any vegetation growing in a stratum definitely below the main crown canopy.

Uneven-Aged Management
The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Group and individual tree selection are examples of this type of management.

Unfavorable Habitat
See Habitat Suitability

Unsuitable Habitat
See Habitat Suitability

Utility Pulp Volume
Logs that do not meet minimum requirements for saw timber but are suitable for the production of usable pulp chips.

V-notch
A V-shaped stream channel generally on steep mountainous terrain.

Glossary and Acronyms

Value Comparison Unit (VCU)
Areas which generally encompass a drainage basin established in the Tongass National Forest to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Visual Absorption Capability
An estimate of the relative ability of the landscape to accept management manipulations without significantly affecting its visual character. The three VAC categories are:

> ***Intermediate VAC:*** Intermediate ability to accept management alternations without significantly affecting the visual character due to moderate landscape complexity.
>
> ***Low VAC:*** Limited ability to accept management alternations without significantly affecting the visual character due to low landscape complexity.
>
> ***High VAC:*** Greatest ability to accept management alternations without significantly affecting visual character due to high landscape complexity.

Value Comparison Unit
A distinct geographic area which encompasses a drainage basin containing one or more large stream system.

Visual Management Classes (VMC)
Qualitative descriptions used in project planning to indicate the relative ease or difficulty that may be required to meet the visual quality objectives for an area. VMCs include:

> ***Class 1:*** Management activities are not evident or are not evident to the casual observer.
>
> ***Class 2:*** Management activities are sometimes evident but are designed to be visually subordinate to natural landscape character.
>
> ***Class 3:*** Management activities are clearly evident and sometimes dominate landscape character, but are designed to appear similar to natural occurrences.
>
> ***Class 4:*** Management activities clearly dominate natural landscape character but are designed to appear as natural occurrences when viewed as background.
>
> ***Class P:*** Preservation (none in the South Lindenberg Area)

Visual Management System
A program developed by the USDA Forest Service to identify the visual characteristics of the Forest landscape and analyze in advance the visual effects of resource management actions.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule

Volume Class
Volume class strata are used to describe the average volume of timber per acre in thousands of board feet (MBF). Following are the volume class strata and the range of volume each contains.

> ***Volume Class Strata 3:*** Less than 8 MBF/acre (cleared land seedlings or pole timber stands).
>
> ***Volume Class Strata 4:*** 8 to 20 MBF/acre.
>
> ***Volume Class Strata 5:*** 20 to 30 MBF/acre.

Volume Class Strata 6: 30 to 50 MBF/acre.

Volume Class Strata 7: 50+ MBF/acre.

Visual Quality Objectives (VQO)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The five categories of VQOs are:

Preservation: Permits ecological changes only. Applies to wilderness areas and other special classified areas.

Retention: Provides for management activities that are visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation.

Partial Retention: Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within one year of project completion.

Modification: Management activities may visually dominate the characteristics of the landscape. However activities must borrow from naturally established form line color and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.

Maximum Modification: Management activities may dominate the landscape. Mitigation measures should be accomplished within five years of project completion.

Watershed
The drainage area of a stream.

Wetland
Those areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wild and Scenic Rivers

Rivers or sections of rivers designated by congressional actions under the 1968 Wild and Scenic Rivers Act, as wild, scenic, or recreational by an act of the Legislature of the State or States through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

Recreational river areas: Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Scenic river areas: Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Wild river areas: Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Wilderness
An area established by the Federal Government and administered either by the Forest Service, National Park Service, Fish and Wildlife Service, or Bureau of Land Management in order to conserve its primeval character and influence for public enjoyment under primitive conditions in perpetuity.

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of the area that includes one or several Value Comparison Units (VCUs) for the purpose of regulating wildlife populations and reporting harvests.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Windthrow
The act of trees being uprooted by the wind.

List of Acronyms

ACMP	Alaska Coastal Management Program
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
AHRS	Alaska Heritage Resource Survey
ANCSA	Alaska Native Claims Settlement Act of 1971
ANHP	Alaska Natural Heritage Program
ANILCA	Alaska National Interest Lands Conservation Act of 1980
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
CMT	Culturally Modified Tree
CZMA	Coastal Zone Management Act of 1976
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing Visual Condition
FA	Foraging Area
FDRs	Forest Development Roads
FEIS	Final Environmental Impact Statement
FICWD	Federal Interagency Committee for Wetland Delineation
FPA	Forest Practices Act
FSH	Forest Service Handbook
GIS	Geographic Information System
GMU	Game Management Unit
GNP	Gross National Product
HCA	Habitat Conservation Area
HSI	Habitat Suitability Index
IDT	Interdisciplinary Team

KV	Knutsen-Vandenberg Act
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
MA	Management Area
MBF	One thousand board feet
MIS	Management Indicator Species
MMBF	One million board feet
MOU	Memorandum of Understanding
NA	Nest Area
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	Nation Marine Fisheries Service
OHV	Off Highway Vehicle
OTA	Office of Technology Assessment
PFA	Post-Fledging Area
RM	Roaded Modified
RMO	Road Management Objective
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SAI	Sale Area Improvement
SHPO	State Historic Preservation Officer
SP	Semi-Primitive Land Use Designation
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TES	Threatened, Endangered, and Sensitive
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TSP	Total Suspended Particulate Matter
TTRA	Tongass Timber Reform Act
USACOE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
VAC	Visual Absorption Capability
VCU	Value Comparison Unit
VMC	Visual Management Classes
VMS	Visual Management System
VMT	Vehicle Mile Traveled
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area
WRA	Wildlife Retention Area

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Appendix A

Unit Descriptions

APPENDIX A

UNIT DESCRIPTIONS

The following are the descriptions of the units proposed in all action alternatives. These descriptions show the major attributes of each harvest unit and considerations used during harvest unit design. Specific resource concerns and mitigations are cited.

During the preliminary planning stage, tentative harvest units and roads were identified. During the (ID Team) IDT analysis harvest units were evaluated and subsequent adjustments to units were made. The results of this analysis are presented in the unit descriptions. The reader will notice that several unit numbers are missing. During the environmental analysis several units were deleted from further consideration and were not part of the final unit pool for the action alternatives.

Unit descriptions show the major resource concerns associated with each harvest unit. In most situations the IDT was able to recommend appropriate mitigations. Thorough explanations of the effectiveness of each mitigation are discussed in Chapter 4 of this DEIS.

Mitigations included with the unit descriptions describe actions either taken by the IDT or actions to be taken during implementation. For example, the IDT located TTRA buffers and unit boundaries during the field investigation and analysis stage. Actions such as feathering unit boundaries and locating harvest groups would be accomplished by the Forest Service during the preparation of each harvest unit for sale. The Forest Service is also responsible for implementing requirements such as Limited Operating Periods, removing debris from streams and partial log suspension by including these items in the Timber Sale Contract. The Purchaser of the Timber Sale Contract is bound by these requirements and the Forest Service monitors operations to insure contract compliance.

SUMMARY OF SELECTED TERMS USED IN THE UNIT DESCRIPTIONS

MITIGATIONS:

Buffer: Leaving an uncut area or strip to provide resource protection.

Feather: This is the practice of partially cutting a 100 to 150 feet strip along a clearcut unit boundary to mitigate visual effects.

Directional Falling: The use of specialized equipment, such as hydraulic jacks, to influence the direction of tree falling. This is generally done around streams or other features requiring protection.

Limited Operating Period: This is a restriction on the time period when a certain operation such as timber harvest can take place. This is done to avoid conflicts with nesting or spawning season.

MBF: Thousand board-feet. The unit of measure used for sawtimber. A board-foot is a measurement that indicates a piece of lumber 12 inches square and 1 inch thick.

Partial Log Suspension: Providing lift to one end of a log during yarding to reduce adverse impacts to soils and watershed. This practice exerts less impact to the ground (as opposed to dragging logs) and is recommended along certain streams and potentially unstable slopes.

Remove Woody Debris: Logging and road slash will be removed if it degrades the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Reserve Tree Clumps: Islands of unharvested trees and snags left within clearcuts for visual and wildlife/biodiversity reasons. Clumps proposed for South Lindenberg usually vary in size between approximately 0.5 and 1.0 acres. This practice offers an opportunity to retain some "old-growth" characteristics in the proposed regenerated timber stand. Clump locations will be determined on the ground by the appropriate resource specialist prior to final layout.

Snag Retention: This is the practice of leaving dead trees unharvested for wildlife/biodiversity reasons. Snags are often cut because they present a safety hazard during harvesting operations. Snags would be retained where they would not present a safety hazard, including feathered unit boundaries and reserve tree clumps. Snags would be designated for retention in all clearcut units where practicable and safe to implement.

Split-Yarding: This is the practice of yarding away from some feature to prevent logs from damaging the same feature. This is usually done along Class II and III streams to prevent the potential of damage to stream banks or to prevent debris from entering streams.

TTRA Buffer Strip: Under TTRA, harvesting is prohibited within 100 feet of all Class I streams and all Class II streams that flow into Class I streams. Often unit boundaries were located to expand buffer widths. Reasons for designating an expanded buffer include maintaining buffer windfirmness, floodplain protection, sideslope sensitivity, inclusions of non-merchantable trees and logging operability.

Yarding: The phase of harvesting where logs are transported from the woods to a landing.

UNIT ATTRIBUTES/OBJECTIVES:

Clearcutting: Harvest method where all trees in given area are cut. This method is used to create an even-aged stand.

Even aged (Stand Management Objective): A timber stand containing trees of the same age.

Group Selection: Harvest method that involves the cutting of trees in small groups approximately 1.5 and 2.5 acres. This method is used to implement an uneven-aged stand management objective. Group selection allows for retention of old-growth characteristics to remain over much of the harvested landscape in this entry.

Interplant: Planting tree seedlings at a wide spacing (25' X 25') among natural regeneration. The inter-planting of Alaska-cedar, western redcedar or Sitka spruce is proposed to increase these species' composition in the regenerated forest stand.

Natural (Regeneration Method): As opposed to artificial regeneration or planting, harvested area would be regenerated by seed from adjacent timber stands.

Rotation Period: The time period between regeneration and harvest. The rotation lengths recommended for each harvest unit are based on the estimated productivity and management goals. In areas primarily managed for timber management, the TLMP Revision specifies that the final harvest of second-growth stands will be equal to or greater than 95 percent of the culmination of mean annual increment (CMAI), the age at which the volume increment for a stand of trees has achieved its highest mean volume). The actual rotation age will be based on the measured growth of each harvest unit, along with other resource considerations. As a result rotation ages could be longer than 80 or 100 years. In areas where visual resources or uneven-aged management is proposed, rotation ages could be up to 160 years. Harvesting timber in the next entry will require a separate environmental analysis.

Uneven Aged (Stand Management Objective): A timber stand containing trees of varying ages and sizes.

Pre-commercial Thinning: The practice of reducing the number of trees per acre in a regenerated stand to promote growth on the remaining stems. This is usually done when the stand is between 15 and 30 years old.

South Lindenberg Timber Sale **Unit Number: 2** **Acres: 65** **ALT: 2,3,4,5**
Net Sawlog Volume: 1,283 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The original unit layout was changed to reduce the unit size to less than 100 acres. The west boundary was located greater than the 100-ft. TTRA buffer, to provide additional protection to fisheries. The upper (east boundary) follows a bench and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located close to west boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams are located within unit
Mitigation:	Require partial log suspension over Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flows. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Slopes exceeding 60 percent are located along northeast boundary
Mitigation:	Require partial log suspension on upper slopes.

Biodiversity

Concern:	Harvest would eliminate old-growth stand structure.
Mitigation:	Minimize disturbance to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	As originally planned unit exceeded, 100 acres and was seen in the middleground from Duncan Canal.
Mitigation:	Unit redesigned from 124 acres to 65 acres and boundary was located to follow natural breaks in terrain.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 100 years
Silvicultural Prescription:	Clearcut	Regeneration Method :Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a slackline yarder with the capability of achieving partial suspension. One landing is planned. The landing required for this unit is proposed to be used as a helicopter landing for portion of Unit 4 (Alternatives 2 and 4 only) and would cover about one acre.

AREA: S. LINDENBERG UNIT:2 ACRES:65 VCU: 439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 32 PHOTO#: 1076-109

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 4 Acres: 72 **ALT: 2,4**
Net Sawlog Volume: 1,357 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follows a bench above the inner gorge of a Class II stream and excludes TTRA buffer, plus additional width to provide extra protection to the stream. The upper (west) boundary follows a bench.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located in close proximity to east boundary.
Mitigation:	Unit boundary was located to exclude TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.

Soils

Concern:	Slopes in upper west part of unit exceeds 70 percent.
Mitigation:	Require full log suspension through helicopter yarding to minimize ground disturbance.
Concern:	As originally planned, a road needed to access this unit would have crossed a Class I stream; the approach was steep, creating water quality concerns.
Mitigation:	Helicopter yarding of unit makes crossing unnecessary.

Wildlife

Concern:	Great blue heron nest within unit.
Mitigation:	Prior to implementation, field reviews of the unit will be completed to determine if the nest has been active during the past two seasons. If nesting activity has occurred during this time, a 300 foot windfirm buffer around the nest will be maintained. Disturbance will be minimized during the active nesting season (generally March 1 to July 31).
Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate four reserve tree clumps (approximately 0.5 to 1.0 acres) within unit. Minimize damage to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.
Concern:	Unit has 13 acres of average value Sitka black-tailed deer habitat in the northwestern end.
Mitigation:	This concern is not mitigated.

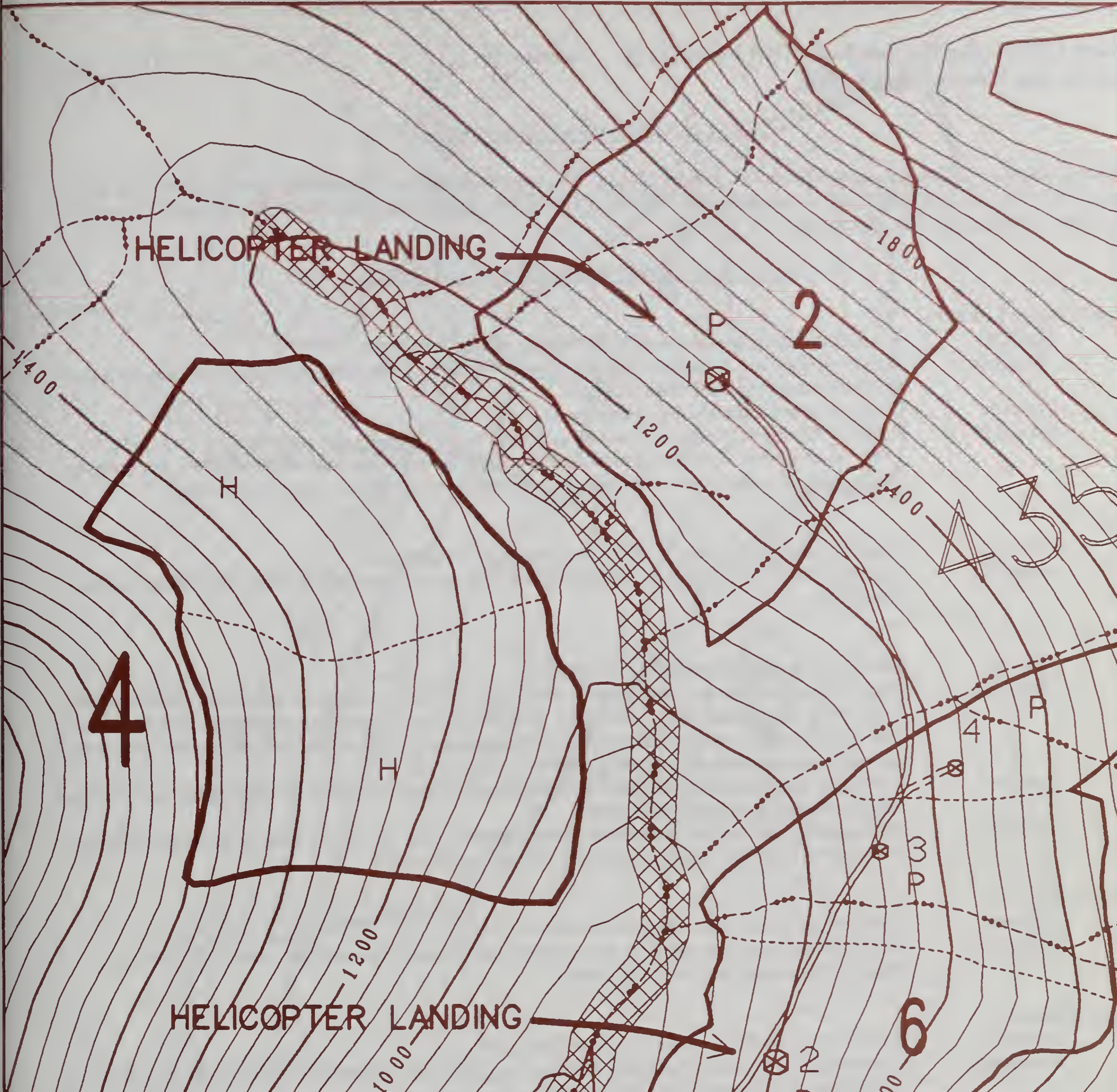
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged Rotation Period: 100 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar will be needed

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to two landings; landing 1 in Unit 4 and landing 2 in Unit 2 in Unit 6. This unit was considered for cable yarding. Helicopter yarding was proposed because of high cost of constructing a road to cross creek and potential water quality concerns related to the crossing.

AREA: S. LINDENBERG UNIT:4 ACRES:72 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 31A PHOTO#: 176-32

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 6 Acres: 99 ALT: 2,3,4,5
Net Sawlog Volume: 1,538 MBF VCU: 439

DEVELOPMENT OF UNIT BOUNDARY

The east boundary was located to exclude 70+ percent slopes. The west boundary was located on a bench above the inner gorge of a Class II stream; the area is greater than the 100-ft. TTRA buffer to provide protection to the stream. The north boundary follows the break in slope above a V-notch.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located in close proximity to west boundary.
Mitigation:	Unit boundary was located to exclude 100 foot TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams are located within unit
Mitigation:	Require directional falling of trees away from stream channels and partial log suspension over Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flows. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Slopes exceeding 60 percent are located along east boundary
Mitigation:	Require partial log suspension on upper slopes. Boundary was located to exclude slopes during unit layout.

Wildlife

Concern:	Blue heron nest is located northeast of unit.
Mitigation:	Prior to implementation, field reviews of the unit will be completed to determine if the nest has been active during the past two seasons. If nesting activity has occurred during this time a 300 foot windfirm buffer around the nest will be maintained. Disturbance will be minimized during the active nesting season (generally March 1 to July 31).
Concern:	Red-tailed and sharp-shinned hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate three reserve tree clumps along upper (east) slope to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

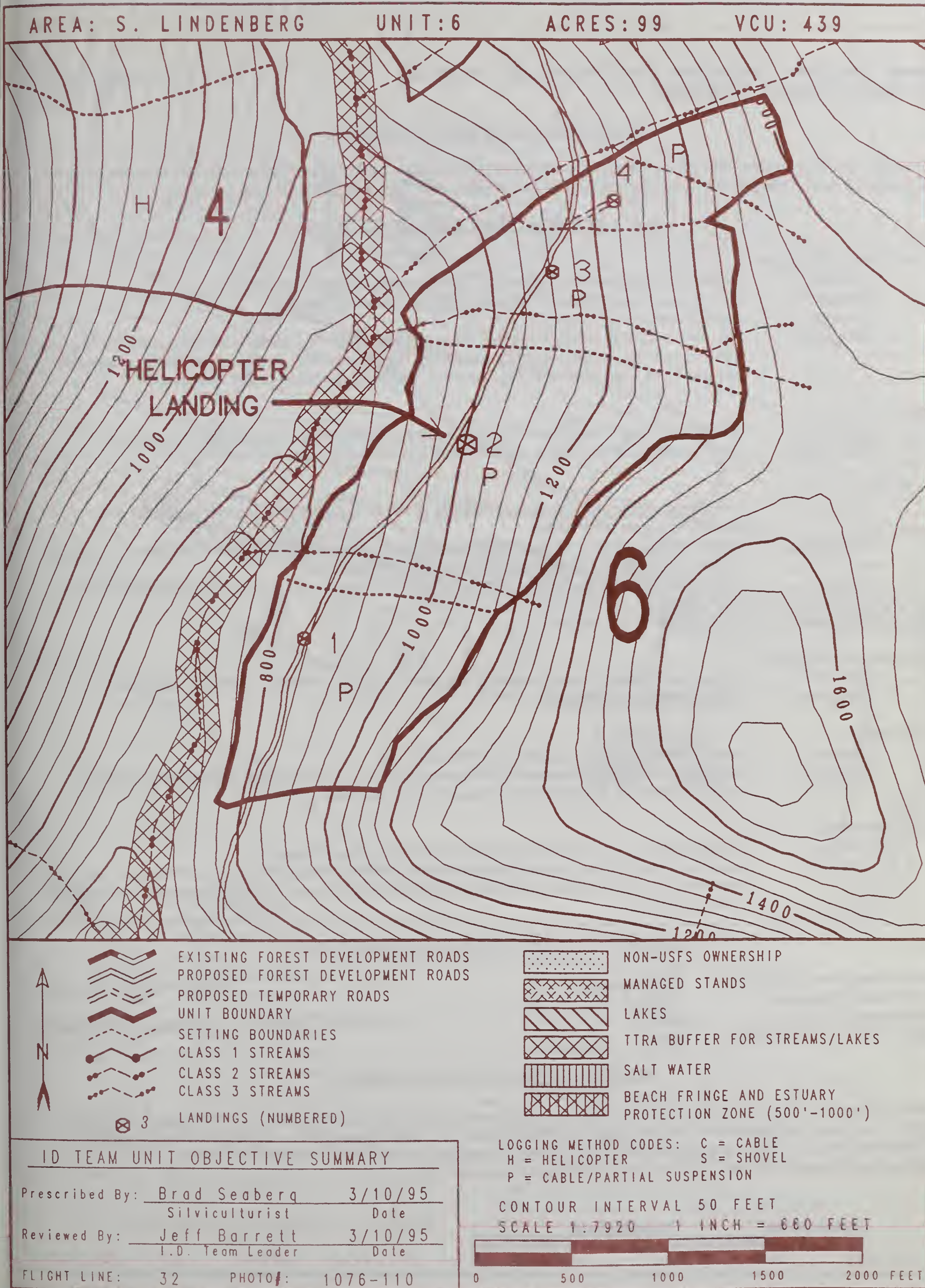
Concern:	Unit is seen in middleground from Duncan Canal.
Mitigation:	Feather east (upper) unit boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning	Other Timber Considerations:	None

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for three slackline settings and one high-lead setting. A slackline cable system is proposed for these three settings to achieve yarding distance and partial log suspension. Locate reserve tree clumps along setting breaks. Landing number 2 in Unit 6 would be used for helicopter yarding Unit 4 (Alternatives 2 and 4) and would cover about one acre.


AREA: S. LINDENBERG UNIT:6 ACRES:99 VCU: 439
H
4
HELICOPTER
LANDING
P
4
3
P
2
P
1
P
6
800
1000
1200
1400
1600
EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)
N
NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
ID TEAM UNIT OBJECTIVE SUMMARY
Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date
Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date
FLIGHT LINE: 32 PHOTO#: 1076-110
LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION
CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET
0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 16 Acres: 50 **ALT: 2,3,4,5**
Net Sawlog Volume: 1,778 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The upper (north) boundary was located to exclude steep and potentially unstable soils. The east and west boundaries follow logical slope break changes. The south boundary follows a muskeg and Class I and Class II TTRA buffers.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I and II streams are located in close proximity to south boundary.
Mitigation:	Unit boundary was located to exclude 100 foot TTRA buffer strip.
Concern:	Class III streams are located within unit
Mitigation:	Require directional falling away from channels and partial log suspension and/or split yarding of Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flows. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Potential for steep, unstable soils was indicated within the upper (north) part of unit.
Mitigation:	Unit boundary was located to exclude steep and potentially unstable areas.

Wildlife

Concern:	Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 38 acres of good value marten habitat and 38 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0.5 to 1.0 acre) on upper slopes to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper portion of unit is seen in middleground from Duncan Canal.
Mitigation:	Upper shoulders of unit were rounded to reduce straight line appearance. Feather upper (north) boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a mobile yarder and shovel logging. Flat ground at south end of unit could be shovel logged. Mobile yarder is proposed on remainder of unit to minimize stream impacts and landing excavation. Lateral yarding capability will facilitate retention of reserve tree clumps and snags. Helicopter landing to yard Unit 150 would be located east of intersection of Roads 4500 and 4503 and would cover about one acre.

AREA: S. LINDENBERG UNIT:16 ACRES:50 VCU: 439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 2/05/96
Silviculturist Date

Reviewed By: Martha Goodavish 2/05/96
I.D. Team Leader Date

FLIGHT LINE: 32 PHOTO#: 1076-110

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 19 Acres: 32 **ALT: 2,3,4,5**
Net Sawlog Volume: 956 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The north (top) boundary was located to reduce yarding distances and maintain feasibility to partially suspend logs on the upper slopes. East and west boundaries were located to follow V-notches (Class III stream) channels. The south boundary was located in response to maintaining 100-ft. TTRA buffers along Class II streams The boundary provides a buffer greater than 100 feet area in some places to afford extra protection to stream.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located in close proximity to south boundary.
Mitigation:	Unit boundary was located to exclude 100-ftTTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams are located within unit.
Mitigation:	Require directional falling away from channels and partial log suspension over Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flows. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Slopes approach 60 percent on upper slopes in north part of unit.
Mitigation:	Require partial log suspension on upper slopes. Unit boundary was located to avoid over-steepened slopes.

Wildlife

Concern:	Unit has 19 acres of good value marten habitat and 19 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

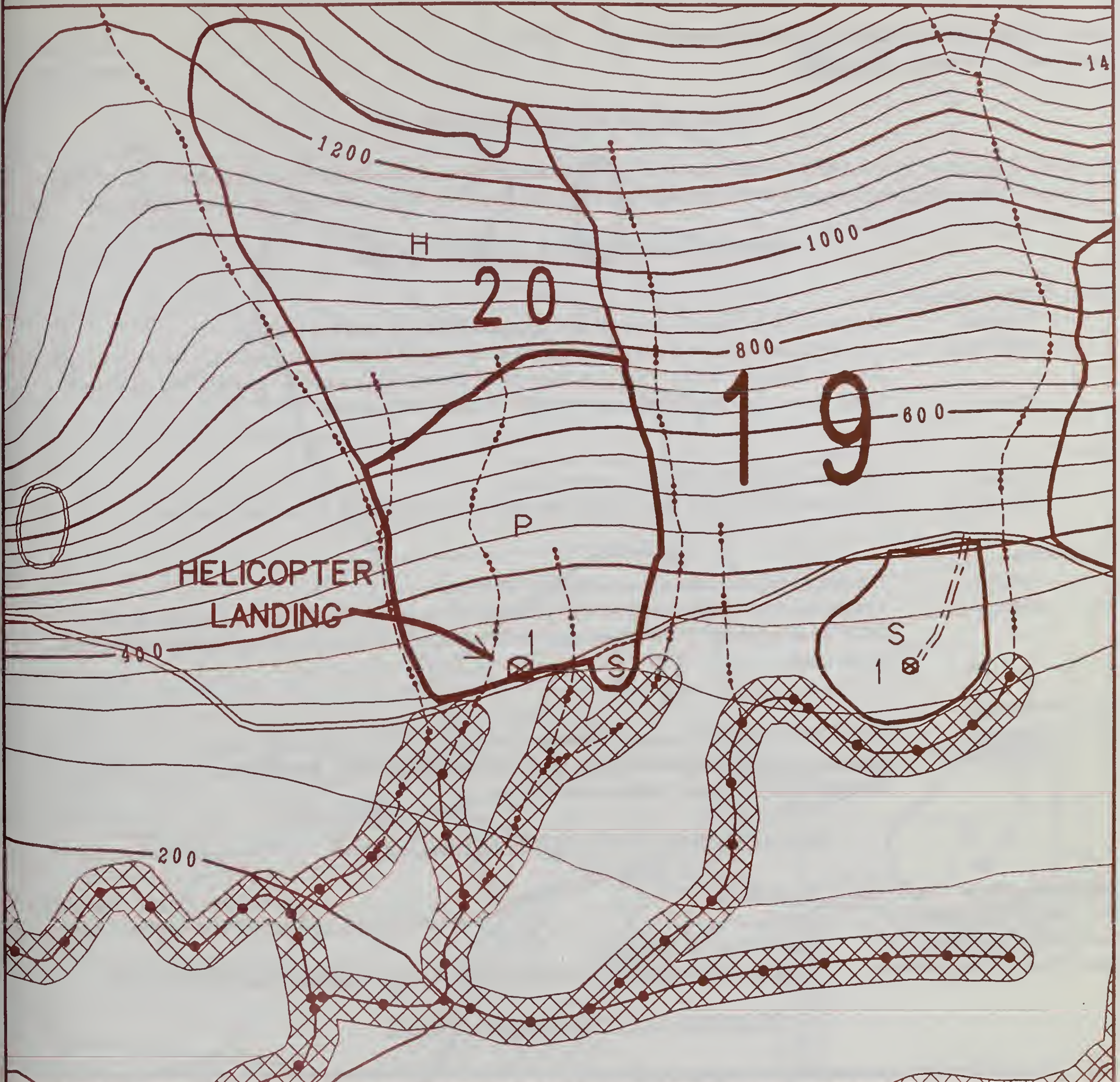
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 80 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for slackline yarding to achieve yarding distance (1,600 feet) and partial log suspension. Landing will be needed for helicopter yarding Unit 20 (Alternatives 4 and 5) and will cover about 1 acre.

AREA: S. LINDENBERG UNIT:19 ACRES:32 VCU: 439



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 32A PHOTO#: 176-69

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 20 Acres: 43 **ALT: 4,5**
Net Sawlog Volume: 536 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The north (top) boundary was located to exclude/avoid extreme hazard soils and non-commercial forest and an old slide area. V-notch channels form both the east and west boundaries. The south boundary follows the north boundary of Unit 19.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Deeply incised Class III channels are adjacent to east and west boundaries.

Mitigation: Unit boundary is located to exclude stream inner gorge. Require directional falling away from V-notches. Remove debris created by Purchaser's that would degrade the quantity and quality of water flows. Existing natural, stable debris would be left undisturbed.

Soils

Concern: Slopes approach 70 percent on upper slopes.

Mitigation: Helicopter yarding will provide full log suspension, and minimize ground disturbance.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate four reserve tree clumps (approximately 0.5 to 1.0 acres) distributed throughout unit to retain a legacy of old growth stand to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: Unit is seen in the middleground from Duncan Canal (Alternatives 4 and 5 only).

Mitigation: Feather north, east, and west boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years

Silvicultural Prescription: Clearcut — Regeneration Method: Natural

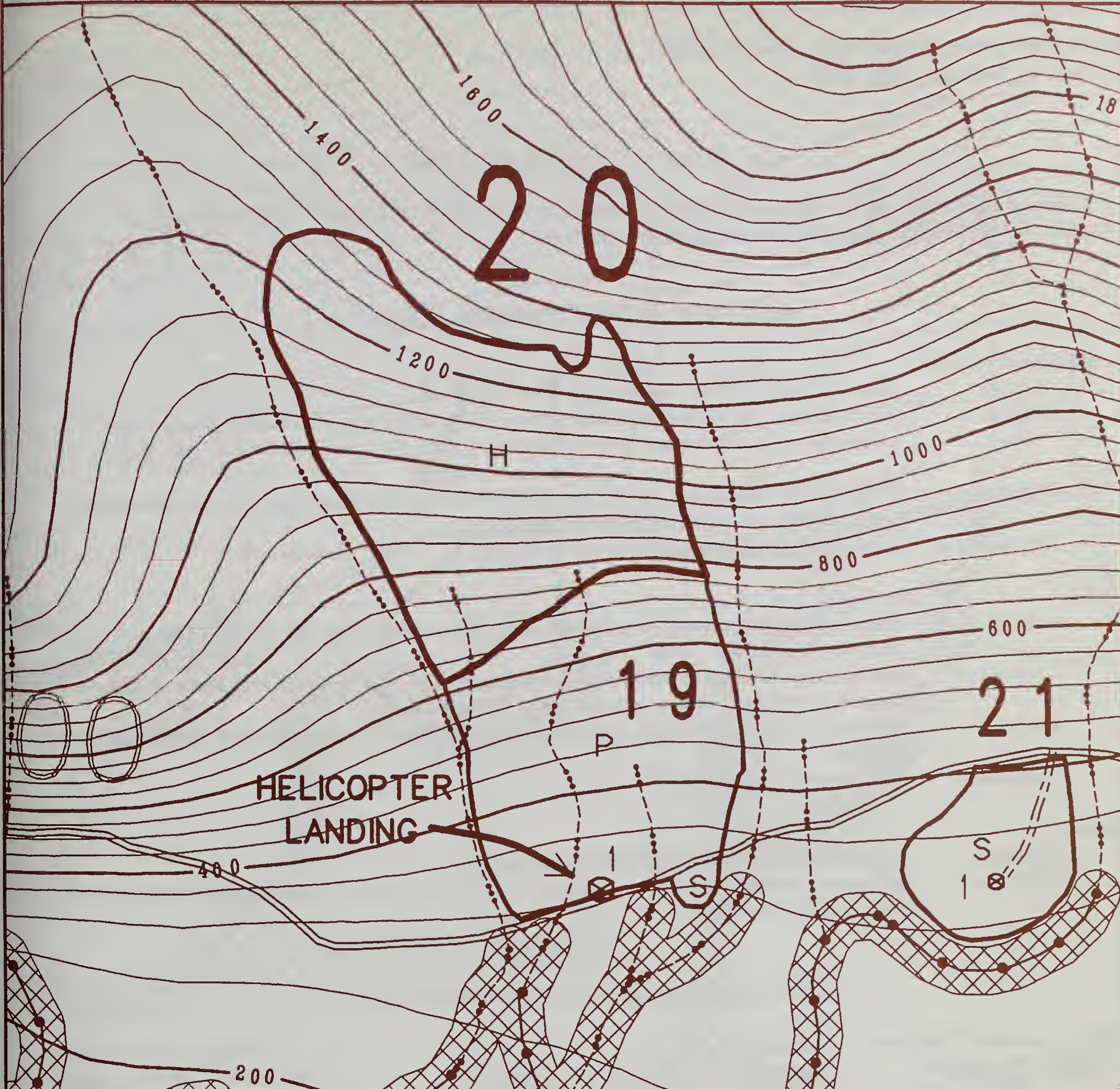
Anticipated Treatments: Precommercial Thinning

Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar will be needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a helicopter yarding to Landing 1 in Unit 19.

AREA: S. LINDENBERG UNIT:20 ACRES:43 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 32A PHOTO#: 176-69

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 21 Acres: 9 **ALT: 2,4,5**
Net Sawlog Volume: 398 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The south and east boundaries were located to follow muskeg and exclude 100-ft. TTRA buffer. The north and west boundaries follow a logical yarding break through commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries
- Concern: Class I stream is located south of unit.
- Mitigation: Unit boundary was located to exclude 100-ft. TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel. Require directional falling away from TTRA buffer.

Timber
- Concern: Excessive soil disturbance during harvesting could increase salmonberry and alder component, causing failure of conifer regeneration.
- Mitigation: Minimize soil disturbance during shovel logging.

Wildlife
- Concern: Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
- Mitigation: Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
- Concern: Unit has 9 acres of good value marten habitat and 9 acres of average value Sitka black-tailed deer habitat.
- Mitigation: This concern is not mitigated.

Biodiversity:
- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Minimize disturbance to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 80 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Interplant Sitka spruce. Monitor regeneration competition.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for shovel logging; a temporary road approximately 0.14 miles long would be needed to provide access.

AREA: S. LINDENBERG   UNIT:21   ACRES:9   VCU: 439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 32A PHOTO#: 176-69

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 24 Acres: 52 **ALT: 2,3,4,5**
Net Sawlog Volume: 1,539 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

Both the east and west boundaries follow Class III streams. The south boundary generally follows the road alignment of proposed Road 43500 and is governed by the location of Class 2 streams and 100-ft. TTRA buffers. The north (upper) boundary was located to achieve partial log suspension using a slackline yarder from two proposed landings.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located in close proximity to the south boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III portion of stream dissects unit.
Mitigation:	Require a combination of partial log suspension, split yarding and directional falling to protect stream channel. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Upper slopes contain areas with slopes approaching 70 percent.
Mitigation:	Require partial log suspension over upper slopes during yarding.

Wildlife

Concern:	Unit has 39 acres of good value marten habitat and 39 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old-growth stand structure.
Mitigation:	Leave two reserve tree clumps (approximately 0.5 to 1 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

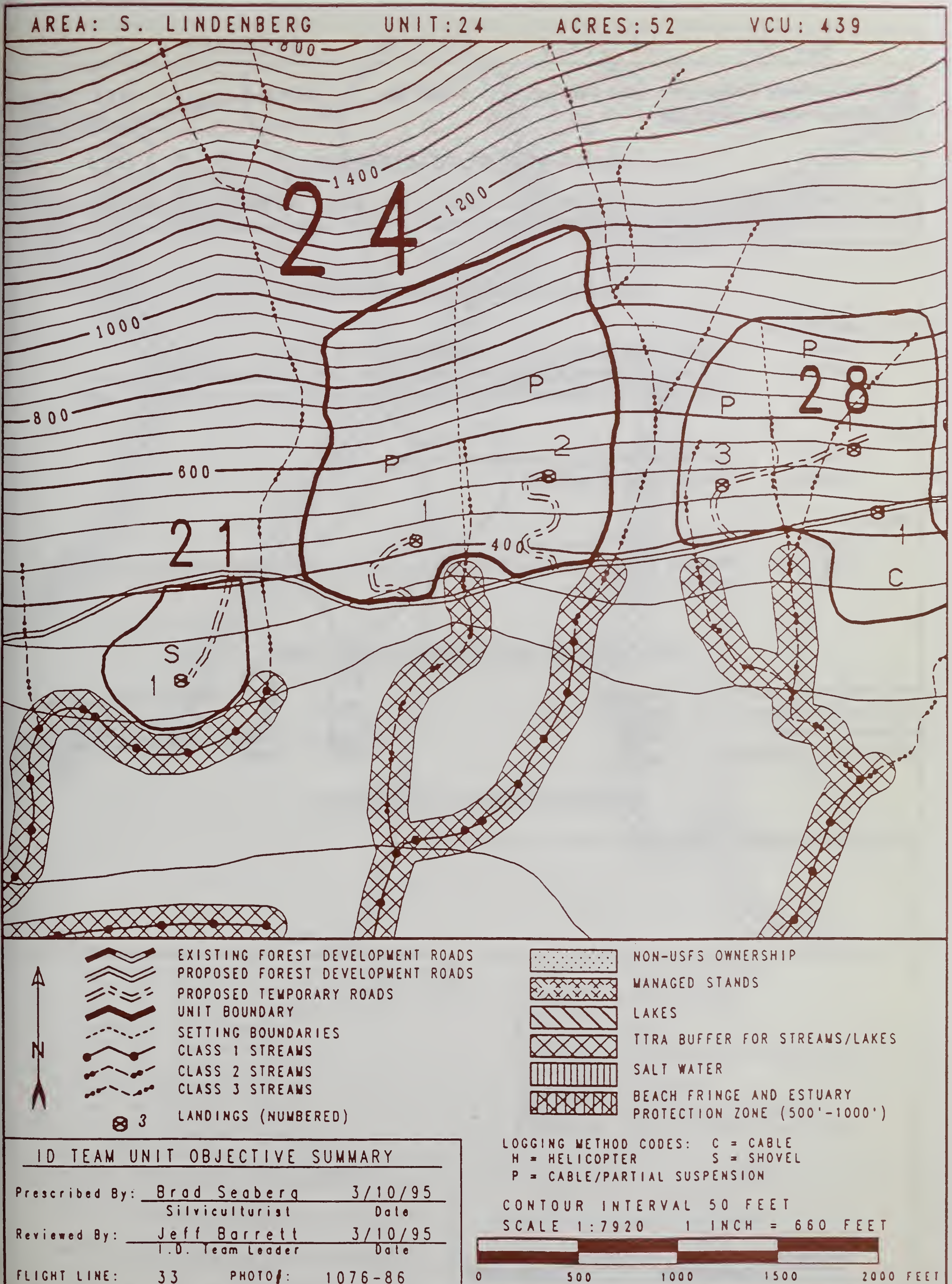
Concern:	Upper portion of unit is seen in the middleground from Duncan Canal.
Mitigation:	Feather upper (north) boundary, to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 80 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a slackline yarder with the capability of yarding 1,600 feet. Unit is planned for two landings and two temporary roads (0.2 miles).


AREA: S. LINDENBERG
UNIT:24
ACRES:52
VCU: 439
24
28
21
1400
1200
1000
800
600
400
P
P
P
P
P
C
S
1
2
3
1
1
1
EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)
NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
N
ID TEAM UNIT OBJECTIVE SUMMARY
Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date
Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date
FLIGHT LINE: 33 PHOTO#: 1076-86
LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION
CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET
0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 26 Acres: 14 **ALT: 2,3,4,5**
Net Sawlog Volume: 338 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary of this unit excludes a buffer on Duncan Creek, a Class I stream. The buffer exceeds the 100-ft. TTRA buffer to provide additional protection to fishery resources in Duncan Creek. The remaining boundaries are determined by muskeg and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Duncan Creek, a Class I stream is located close to north boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel. Require directional falling away from TTRA buffer.

Wildlife

Concern:	Unit has 14 acres of good value marten habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize disturbance to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for highlead yarding to one landing in the center of the unit.

AREA: S. LINDENBERG UNIT:26 ACRES:14 VCU: 439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-81

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 28 Acres: 37 **ALT: 2,3,4,5**
Net Sawlog Volume: 923 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The south boundary is determined primarily by the presence of Class II streams and associated 100-ft. TTRA buffers. In some cases the buffer exceeds 100 feet to maintain a logical boundary. The west follows a V-notch channel.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located in close proximity to west boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.
Concern:	Several Class III are streams located within unit
Mitigation:	Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Require split yarding and/or partial log suspension of Class III streams that dissect unit.
Concern:	Proposed temporary spur road crosses several Class III streams, which have an effect on downstream fish bearing water.
Mitigation:	Riprap culvert inlets and outlets. Avoid channel width changes and protect embankments.

Wildlife

Concern:	Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 35 acres of good value marten habitat and 35 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0.5 to 1.0 acre) along setting break between Landings 1 and 3 to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper portion of unit is seen in middleground from Duncan Canal.
Mitigation:	Feather upper (north) boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

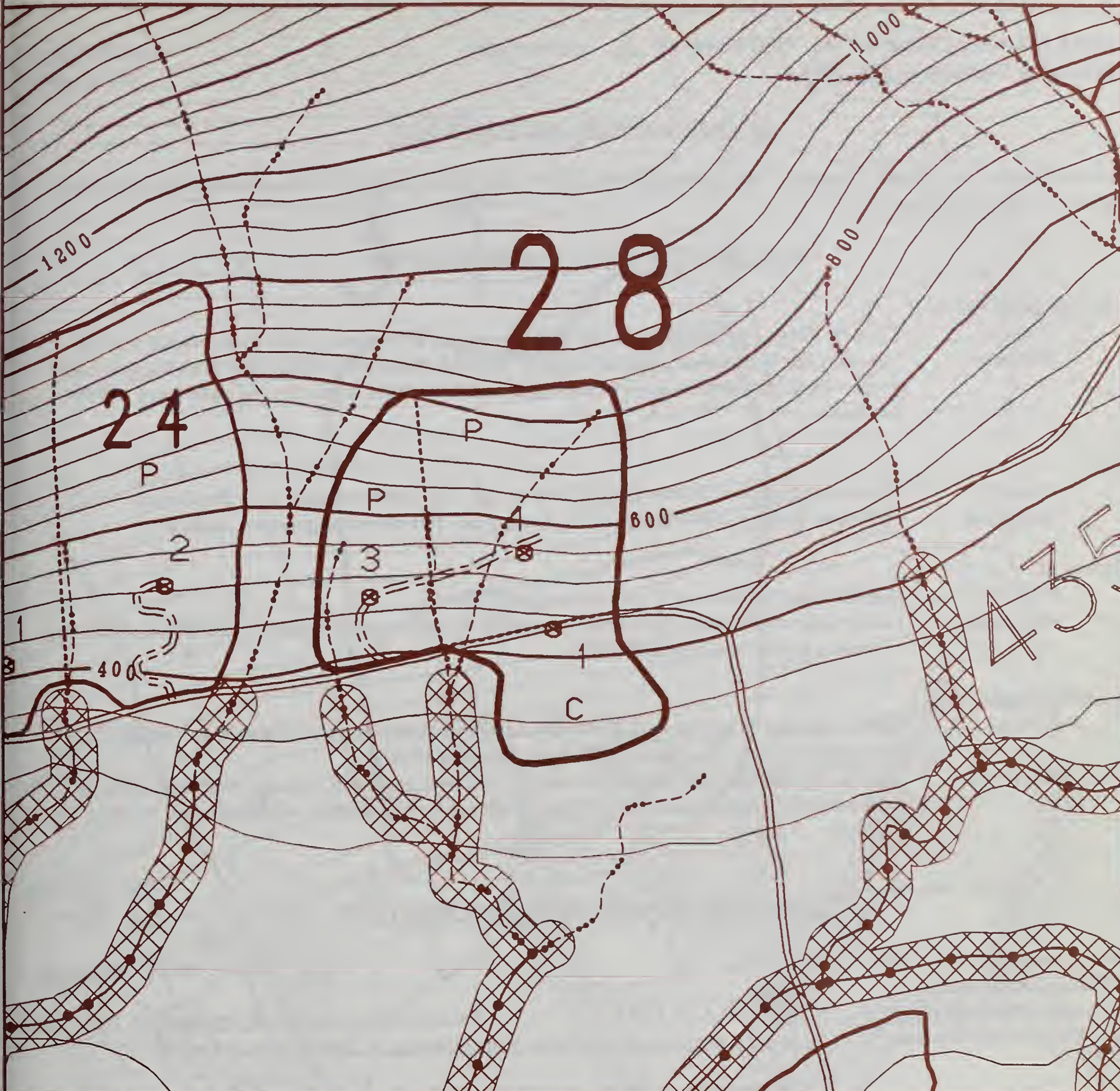
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for highlead yarding to three landings. One temporary spur (0.2 miles) is needed to access two landings.

AREA: S. LINDENBERG UNIT:28 ACRES:37 VCU: 439



N

- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg Silviculturist	3/10/95 Date
Reviewed By:	Jeff Barrett I.D. Team Leader	3/10/95 Date
FLIGHT LINE: 33	PHOTO#:	1076-186

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 31 Acres: 45 **ALT: 3,4,5**
Net Sawlog Volume: 1,128 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

Class III stream forms the east boundary. Upper boundary of Unit 32 forms south boundary. Upper boundary undulates in response to visual concerns.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Class III streams paralleling east and west boundaries drain directly into Class I and II streams.

Mitigation: Maintain east boundary at edge of V-notch. Require directional falling away from V-notch inner gorge. Class III streams paralleling east and west boundaries drain directly into Class I and II streams.

Soils

Concern: High hazard soils are located in south half of unit with slopes between 50 to 70 percent.

Mitigation: Helicopter yarding will achieve full log suspension, and minimize ground disturbance.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate three reserve tree clumps (approximately 0.5 to 1.0 acres) randomly distributed within unit to retain a legacy of old growth stand.

Visual Resources

Concern: Harvest opening is seen in background from Duncan Canal. In combination with Unit 32 (Alternatives 3,4,5), cumulative harvested opening is 89 acres.

Mitigation: Top (north) boundary was located to undulate. Feather unit north, east and west boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

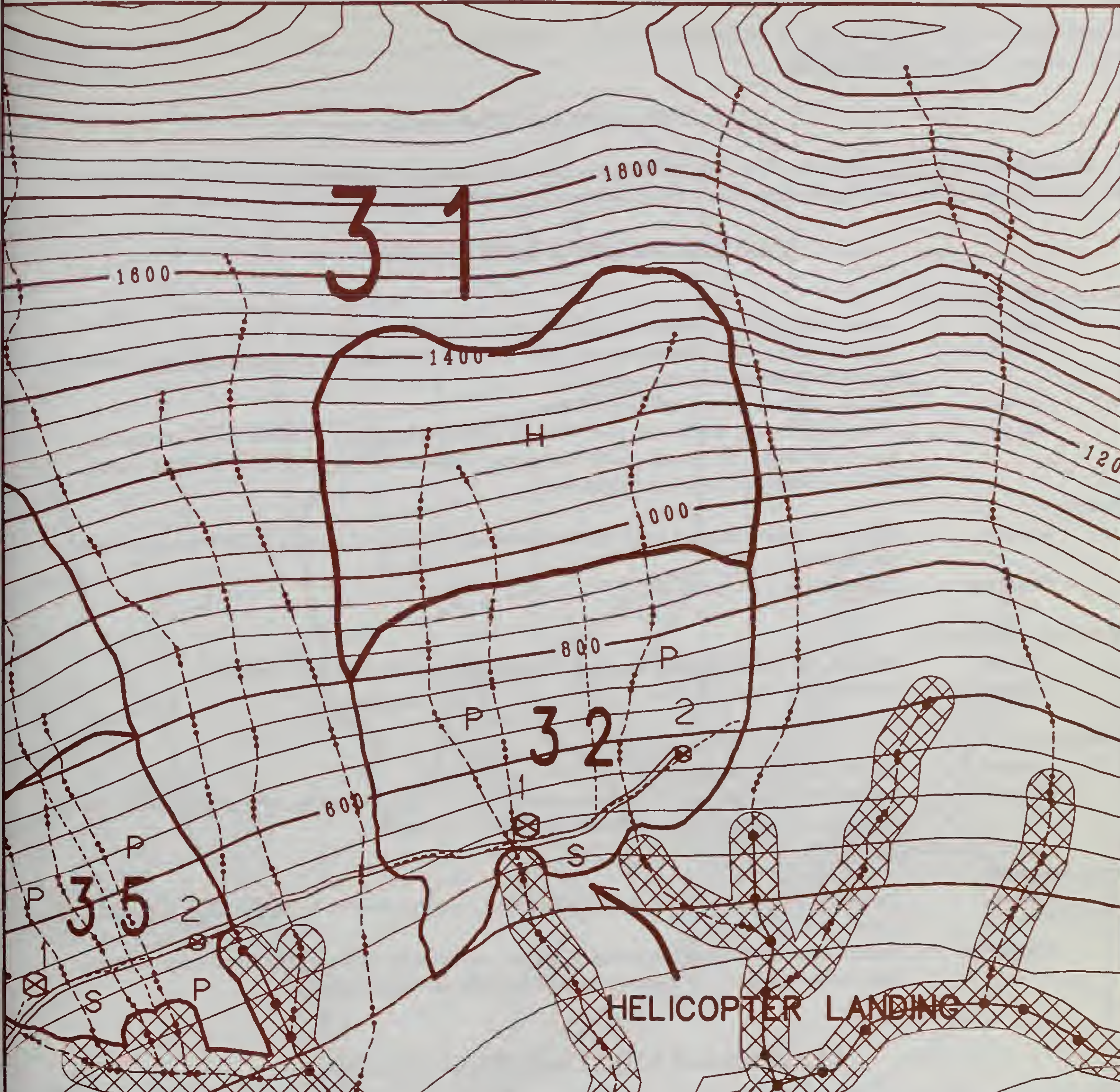
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 1 in Unit 32.

AREA: S. LINDENBERG UNIT:31 ACRES:45 VCU: 439



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)

N

- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-82

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 32 Acres: 44 **ALT: 2,3,4,5**
Net Sawlog Volume: 1,094 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The east and west boundaries are formed by Class III streams. The south boundary is dictated by Class II TTRA buffers. The upper boundary follows a logical slope break and is common to south boundary of Unit 31.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located in close proximity to south boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer strips, plus additional area to reduce sedimentation into the stream channel.
Concern:	Numerous Class III streams dissect unit.
Mitigation:	Require partial log suspension over Class III streams within unit. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Unit has 33 acres of good value marten habitat and 33 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0. 5 to 1.0 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper (north) portion of unit (under Alternative 2 only) is seen in background from Duncan Canal.
Mitigation:	Feather upper (northwest) boundary to reduce angular edge under Alternative 2 only. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged Rotation Period: 100 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a slackline yarder to operate from two landings along Road 43501. Partial log suspension will be required on slopes above road to minimize impacts to streams. Shovel logging is proposed for that portion of the unit below the road. Landing 1 would be used as a helicopter landing for Unit 31 (Alternatives 3, 4, and 5) and cover about 1 acre.

AREA: S. LINDENBERG UNIT:32 ACRES:44 VCU: 439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-82

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 34 Acres: 30 **ALT 3,4,5**
Net Sawlog Volume: 758 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The northeast and southwest boundaries generally follow Class III stream channels. The upper boundary undulates in response to visual concerns. Lower (southeast) boundary is located along upper boundary of Unit 35.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Several Class III streams are located within unit.
Mitigation:	Require directional falling from stream channel. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Unit has 1 acre of good value marten and 1 acre of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate three reserve tree clumps (approximately 0.5 to 1.0 acres) distributed throughout unit to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in background from Duncan Canal.
Mitigation:	Unit was reduced in size and north boundary was located to undulate. Feather northwest, northeast, and southwest boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

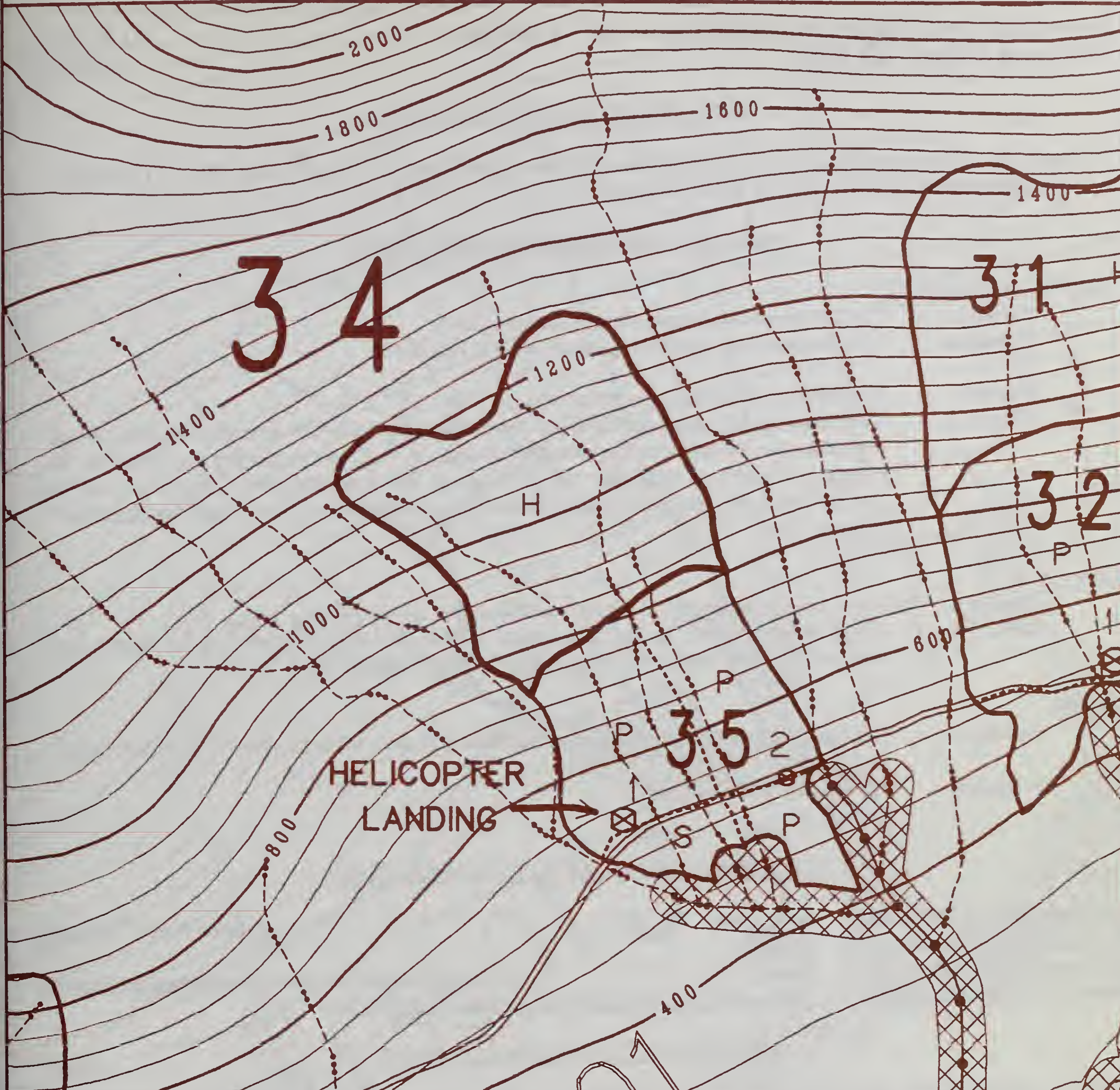
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 80 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Alaska-cedar decline in unit; do not plant Alaska-cedar.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 1 in Unit 35.

AREA: S. LINDENBERG UNIT:34 ACRES:30 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-82

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 35 Acres: 26 **ALT: 2,3,4,5**
Net Sawlog Volume: 649 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The south and southeast boundaries of unit are located in response to Class II streams and associated 100-ft. TTRA buffer. East and west boundaries follow Class III stream channels.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located close to south boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer.
Concern:	Several Class III streams dissect harvest unit.
Mitigation:	Require partial log suspension on upper slopes and stream channels. Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Split yard streams below road with mobile yarder or do not cross streams with shovel yarder, except along roadway.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0.5 to 1.0 acres) along setting break to provide for structural diversity throughout the rotation life of the stand.

Wildlife

Concern:	Unit has 25 acres of good value marten habitat and 25 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	100 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	Alaska-cedar decline in unit; do not plant Alaska-cedar.		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a slackline yarder to operate from two landings. Partial log suspension would be required for yarding upper slopes. The area below the road is proposed for a combination of mobile yarder and shovel yarding. Landing 1 would be used for helicopter yarding Unit 34 (Alternatives 3,4 and 5) and would cover 1 acre.

AREA: S. LINDENBERG UNIT:35 ACRES:26 VCU: 439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-82

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 36 Acres: 86 **ALT: 3,4,5**
Net Sawlog Volume: 1,842 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The north and south boundaries generally follow V-Notches and areas of non-commercial forest. The west boundary excludes 100-ft. TTRA buffer and muskeg.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Several Class III streams are located within unit.
Mitigation: Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern: Unit has 26 acres of good value marten habitat in the western half.
Mitigation: This concern is not mitigated.

TES Plants and Animals

Concern: Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation: This concern is not mitigated.

Biodiversity

Concern: Clearcut harvest would eliminate old growth structure.
Mitigation: Locate four (4) reserve tree clumps (approximately 0.5 to 1.0 acre) distributed throughout unit to provide for structural diversity throughout the rotation life of the stand.

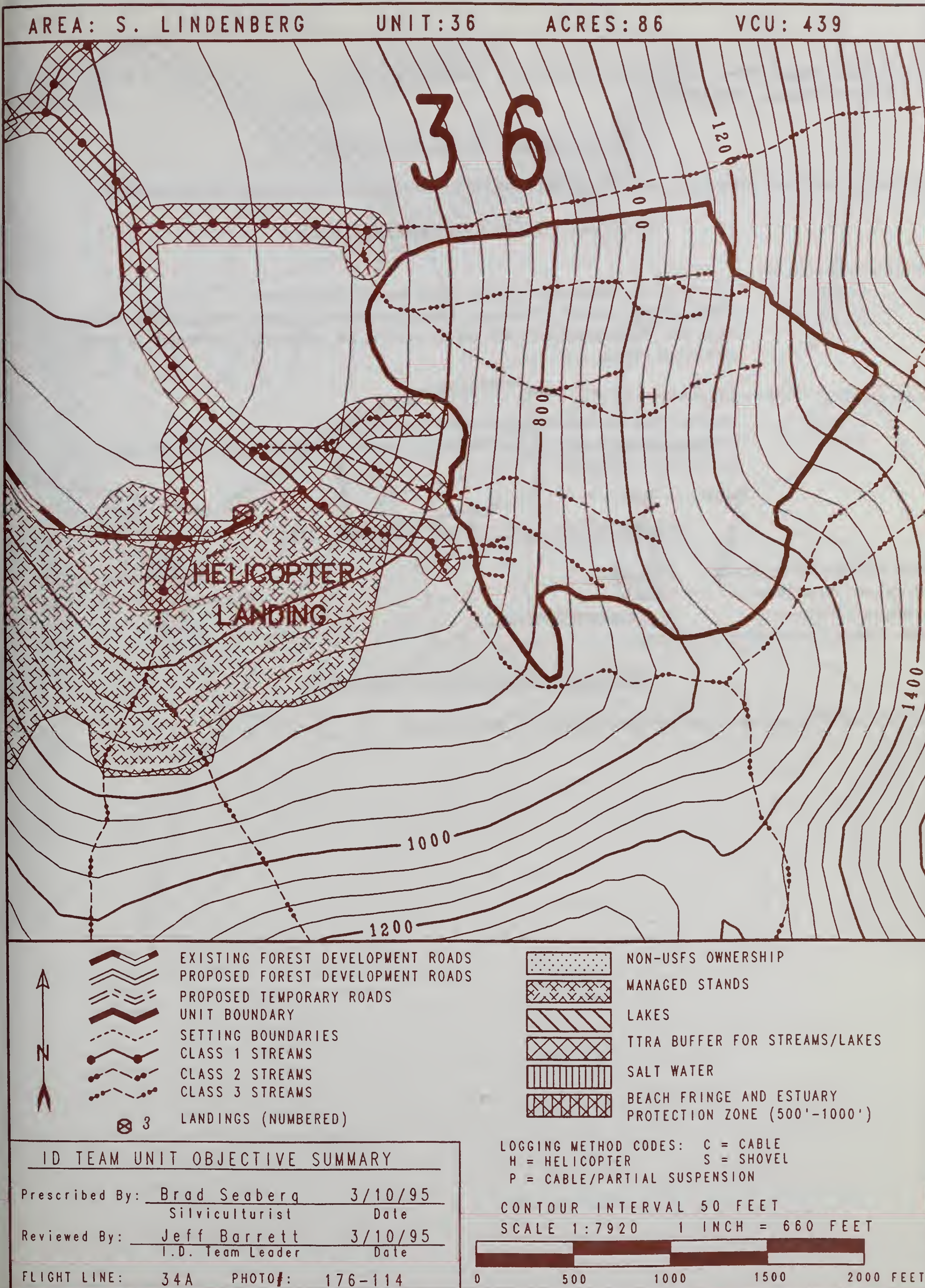
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Alaska-cedar decline in unit; do not plant Alaska-cedar.

Rotation Period: 110 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding. Landing would be located at the end of existing road within managed stand west of unit. Locate four (4) reserve tree clumps within unit, taking advantage of natural breaks and features to minimize windthrow risk.


AREA: S. LINDENBERG
UNIT:36
ACRES:86
VCU: 439
36
1200
800
H
HELICOPTER LANDING
1000
1200
1400
EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)
N
NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
ID TEAM UNIT OBJECTIVE SUMMARY
Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date
Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date
FLIGHT LINE: 34A PHOTO#: 176-114
LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION
CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET
0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 37 Acres: 14 **ALT: 2,3,4,5**
Net Sawlog Volume: 180 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

Boundaries follow non-commercial forest and existing Road 6350. Existing rock pit is located along east boundary.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Three Class III streams dissect unit and drain into a Class I stream.
Mitigation:	Remove debris created by Purchaser's operations that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Use mobile yarder to split-yard streams within unit.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for yarding by a mobile yarder along the existing roadway.

AREA: S. LINDENBERG UNIT:37 ACRES:14 VCU: 439

N

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-81

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 39 Acres: 25 **ALT: 3,4,5**
Net Sawlog Volume: 494 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows Class II TTRA buffers and additional buffer to protect watershed and fisheries resources. The north and south boundaries follow Class III stream channels. The east boundary follows a logical slope break and forms the west boundary of Unit 41.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

	Concern:	Class II streams are located in close proximity to west unit boundary.
	Mitigation:	Unit boundaries are located to exclude TTRA buffers, plus additional area to reduce sedimentation into the stream channel. Require directional falling away from Class II streams along west boundary of unit.
	Concern:	Class III stream is located within unit.
	Mitigation:	Require partial log suspension and directional falling of stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

	Concern:	Slopes approach 60 percent on upper slopes.
	Mitigation:	Require partial log suspension on upper slopes

Wildlife

	Concern:	Unit has 5 acres of good value marten habitat in the western end.
	Mitigation:	This concern is not mitigated.

TES Plants and Animals

	Concern:	Harvest may disturb nesting marbled murrelets, a Category 2 candidate species.
	Mitigation:	This concern is not mitigated.

Biodiversity

	Concern:	Harvest would eliminate old growth stand structure.
	Mitigation:	Minimize damage to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

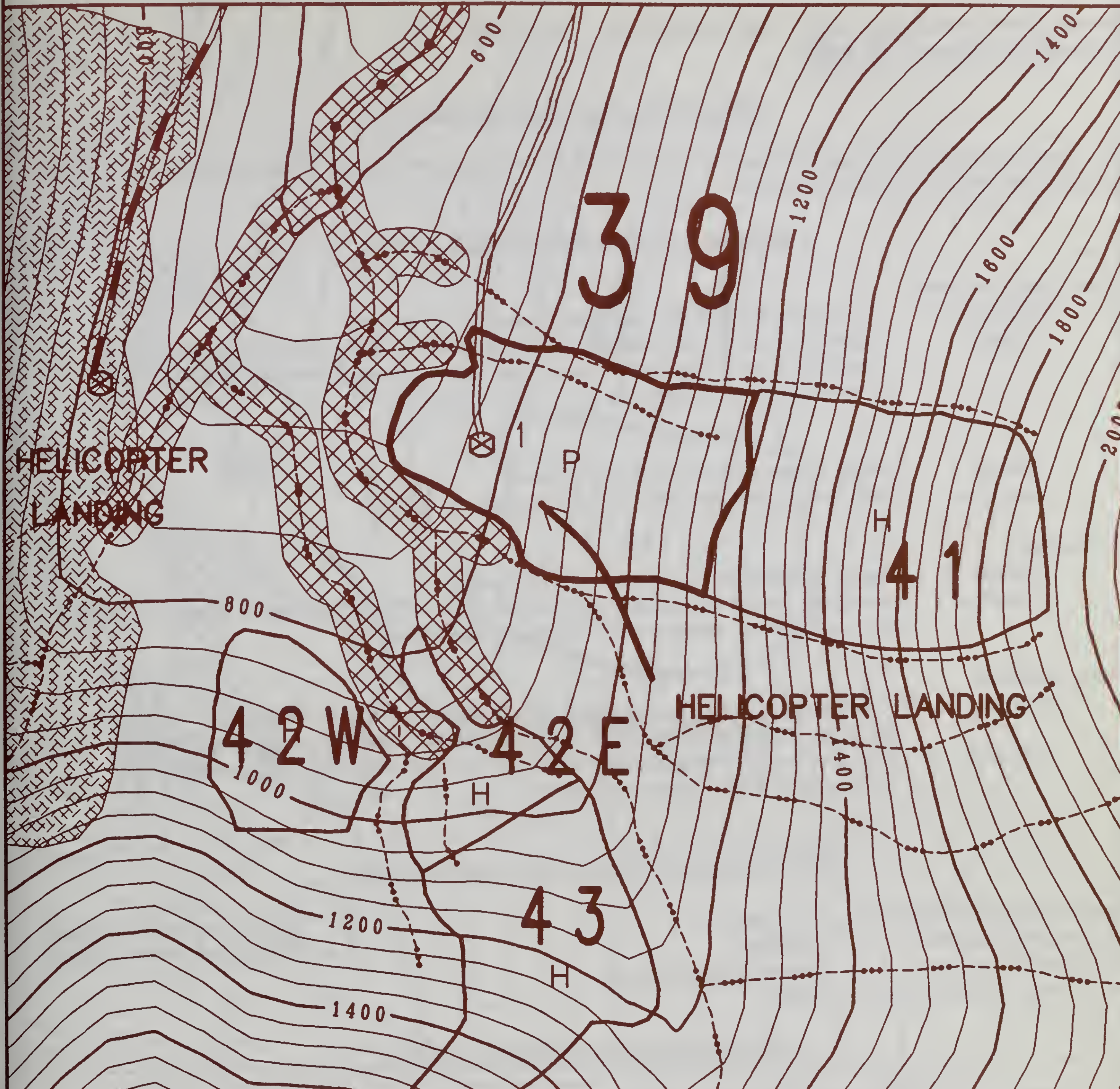
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	Alaska-cedar decline in unit; do not plant Alaska-cedar.		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned to be yarded by a slackline yarder to one landing. This landing is planned as a helicopter landing for Unit 41 (Alternatives 3, 4 and 5) and would cover 1 acre. Partial log suspension will be required.

AREA: S. LINDENBERG   UNIT:39   ACRES:25   VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg, Silviculturist — Date: 1/26/96

Reviewed By: Ron Bockelman, I.D. Team Leader — Date: 1/26/96

FLIGHT LINE: 33   PHOTO#: 1076-84

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER   S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920   1 INCH = 660 FEET

0   500   1000   1500   2000 FEET

South Lindenberg Timber Sale Unit Number: 41 Acres: 29 **ALT: 3,4,5**
Net Sawlog Volume: 659 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows the east boundary of Unit 39. Both the south and north boundaries follow Class III streams. The east boundary follows non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Class III V-notch channels parallel north and south boundaries.

Mitigation: Require directional falling away from Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern: Slopes approach 60 percent on upper slopes.

Mitigation: Helicopter yarding will achieve full log suspension.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate two reserve tree clumps (approximately 0.5 to 1.0 acres) throughout unit to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: As originally planned, the cumulative size of harvested opening (in conjunction with Unit 39) was too large. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

Mitigation: Harvested opening was reduced from 103 to 54 acres. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

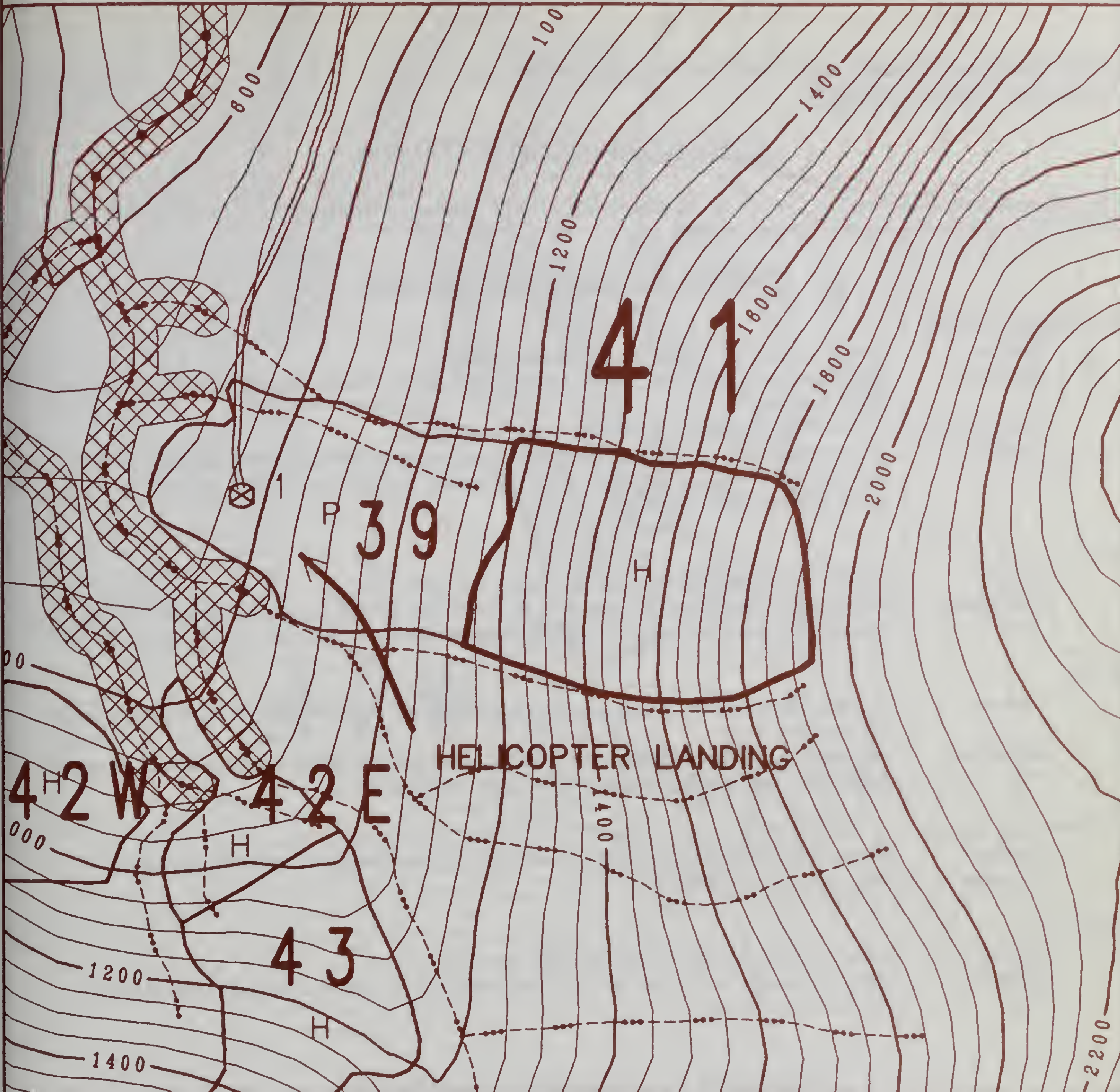
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 1 in Unit 41.

AREA: S. LINDENBERG UNIT:41 ACRES:29 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS	NON-USFS OWNERSHIP
PROPOSED FOREST DEVELOPMENT ROADS	MANAGED STANDS
PROPOSED TEMPORARY ROADS	LAKES
UNIT BOUNDARY	TTRA BUFFER FOR STREAMS/LAKES
SETTING BOUNDARIES	SALT WATER
CLASS 1 STREAMS	BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
CLASS 2 STREAMS	
CLASS 3 STREAMS	
⊗ 3 LANDINGS (NUMBERED)	

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 1/26/96
Silviculturist Date

Reviewed By: Ron Bockelman 1/26/96
I.D. Team Leader Date

FLIGHT LINE: 33 PHOTO#: 1076-84

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 42 Acres: 18 **ALT: 3,4,5**
Net Sawlog Volume: 437 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The unit boundaries are dictated by Class II and III streams and a recent landslide. The landslide and associated Class III stream effectively divides the unit into two sections.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located close to north boundary.
Mitigation:	Boundaries were located to exclude 100-ft. TTRA buffer. Require directional falling away from TTRA buffers.
Concern:	Several Class III streams are located within west setting.
Mitigation:	Require directional falling away from Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Slide is located in center of originally planned unit
Mitigation:	Unit boundary was located to exclude slide. Helicopter yarding is proposed on adjacent areas to minimize soil disturbance that could trigger additional mass movement.

Wildlife

Concern:	Red-tailed hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

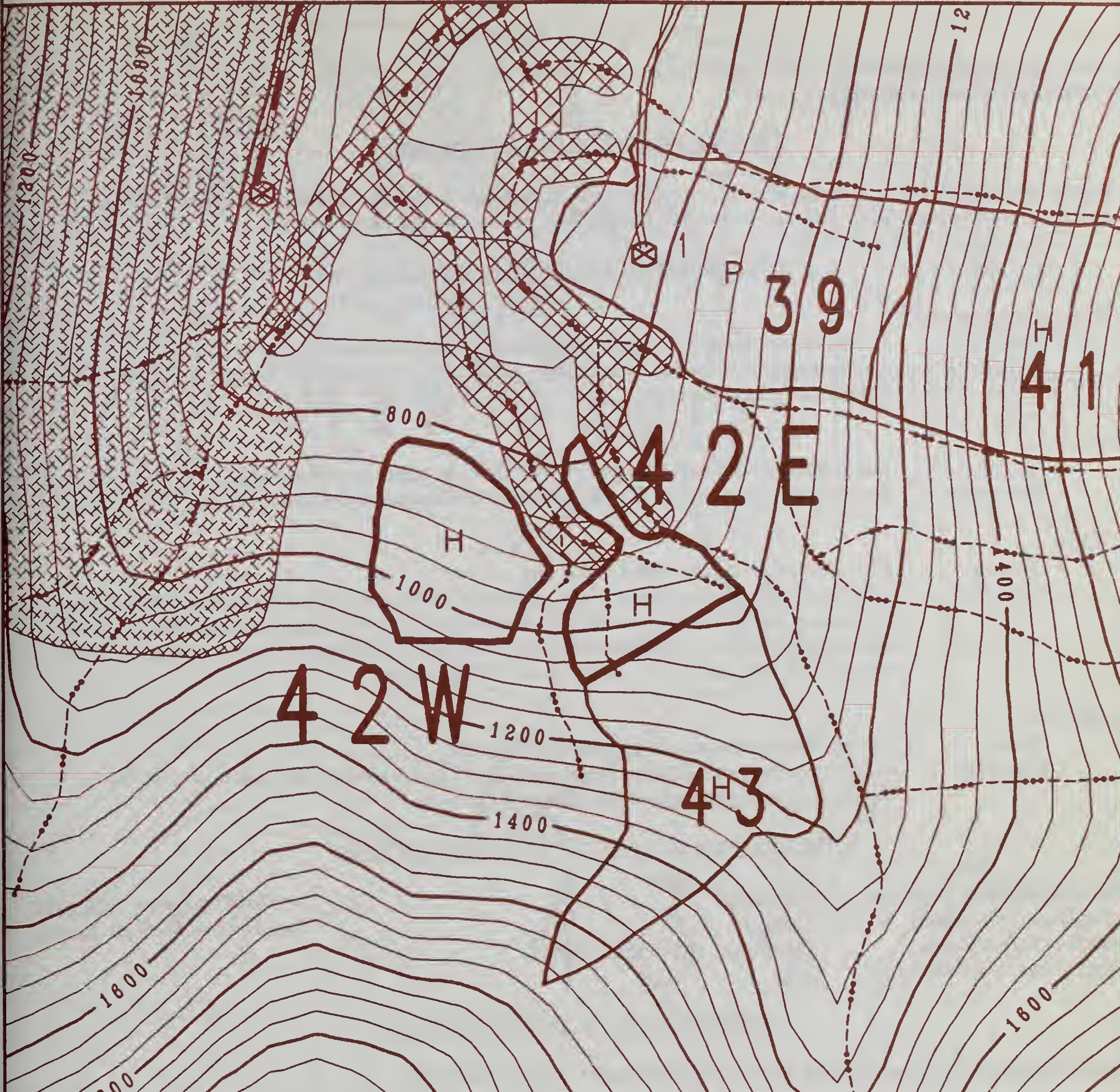
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

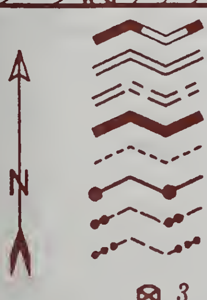
Rotation Period: 80 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to landing at the end of existing Road 6359. This unit was originally planned for cable yarding. Helicopter yarding is proposed due to land instability and cost of constructing road to low volume area.

AREA: S. LINDENBERG UNIT:42 ACRES:18 VCU: 439





- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

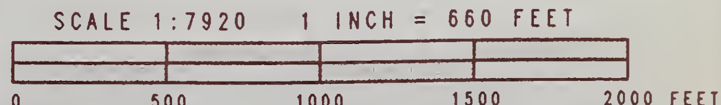
Prescribed By: Brad Seaberg 1/26/96
Silviculturist Date

Reviewed By: Ron Bockelman 1/26/96
I.D. Team Leader Date

FLIGHT LINE: 33 PHOTO#: 1076-183

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET



South Lindenberg Timber Sale Unit Number: 43 Acres: 21 ALT: 3,4,5
Net Sawlog Volume: 438 MBF VCU: 439

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follows a V-Notch channel. The upper (south) boundary follows scrub timber. The west boundary excludes over-steepened slopes. The north boundary follows the common boundary with Unit 42.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Deeply incised Class III channel is located along the east boundary.

Mitigation: Unit boundary is located to exclude inner gorge of Class III channel. Require directional falling of trees away from channel.

Soils

Concern: Over-steepened and unstable slopes were located in originally planned unit.

Mitigation: Unit boundary is located to exclude area of over-steepened and unstable slopes.

Wildlife

Concern: Red-tailed hawk nest is located in the unit.

Mitigation: Prior to implementation, field reviews of the unit will be completed to determine if the nest has been active during the past two seasons. If nesting activity has occurred during this time a 300 foot windfirm buffer around the nest will be maintained. Disturbance will be minimized during the active nesting season (generally March 1 to July 31).

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate two reserve tree clumps (approximately 0.5 to 1.0 acres) within unit to provide for structural diversity throughout the rotation life of stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

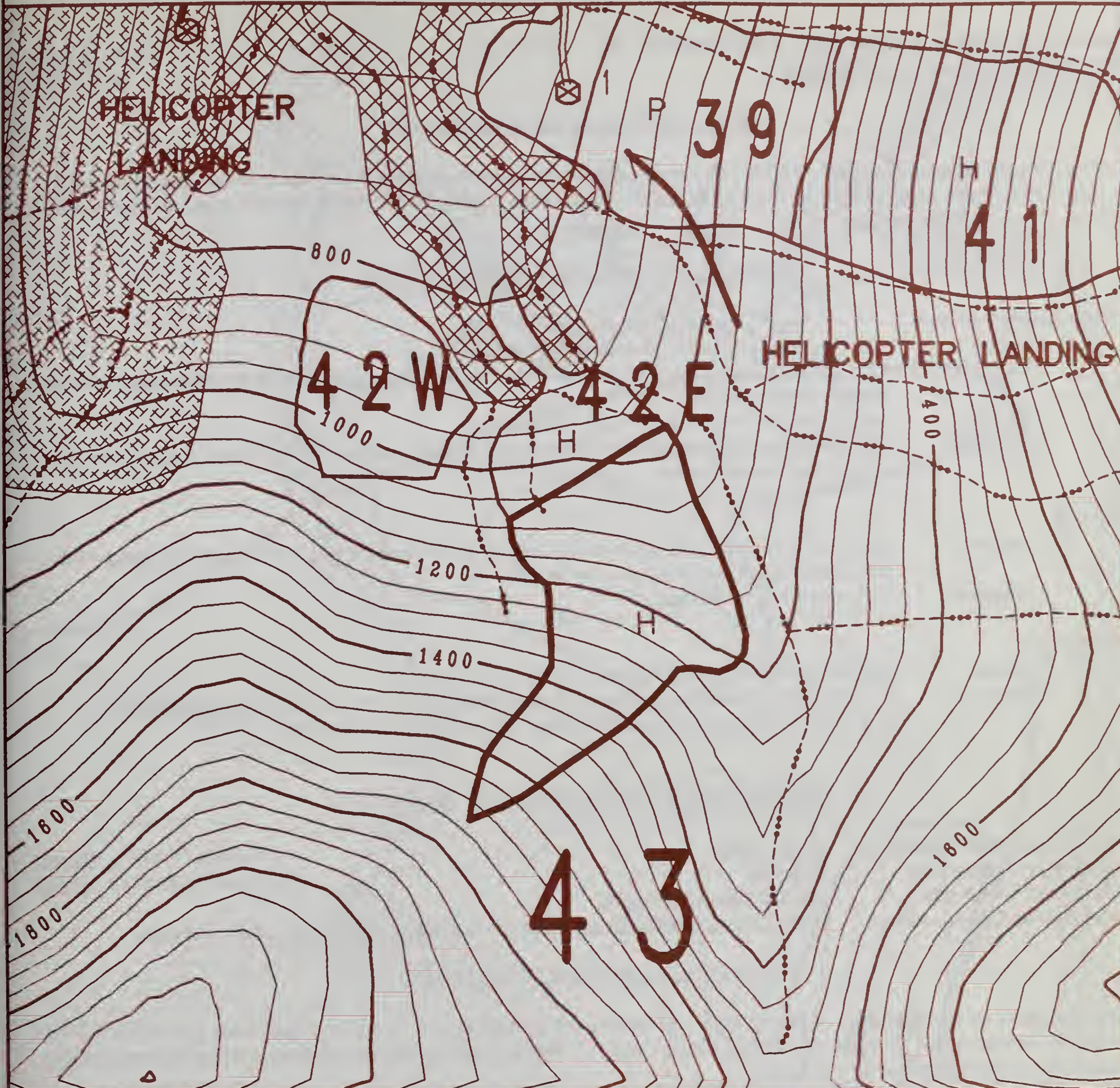
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to a landing at the end of existing Road 6359.

AREA: S. LINDENBERG UNIT:43 ACRES:21 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg	1/26/96
	Silviculturist	Date
Reviewed By:	Ron Bockelman	1/26/96
	I.D. Team Leader	Date

FLIGHT LINE: 33 PHOTO#: 1076-183

South Lindenberg Timber Sale Unit Number: 44 Acres: 54 **ALT: 2,3,4,5**
Net Sawlog Volume: 1,080 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The south and east boundaries follow a logical slope break and non-commercial forest. A Class II stream and associated Class II TTRA buffer is located along the west boundary. Parts of the north boundary are dictated by non-commercial forest, Class I TTRA buffer and existing road.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I stream is located close to north boundary.
Mitigation:	Unit boundary was located to exclude TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class II stream is located near west boundary.
Mitigation:	Unit boundary was located to exclude Class II TTRA stream buffer from unit. Require directional falling from stream buffers.

Wildlife

Concern:	Unit has 33 acres of good value marten habitat in the northern end, and 17 acres of average value Sitka black-tailed deer habitat in the middle.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate three (3) reserve tree clumps (approximately 0.5 to 1.0 acres) along setting breaks to provide for structural diversity throughout the rotation life of the stand.

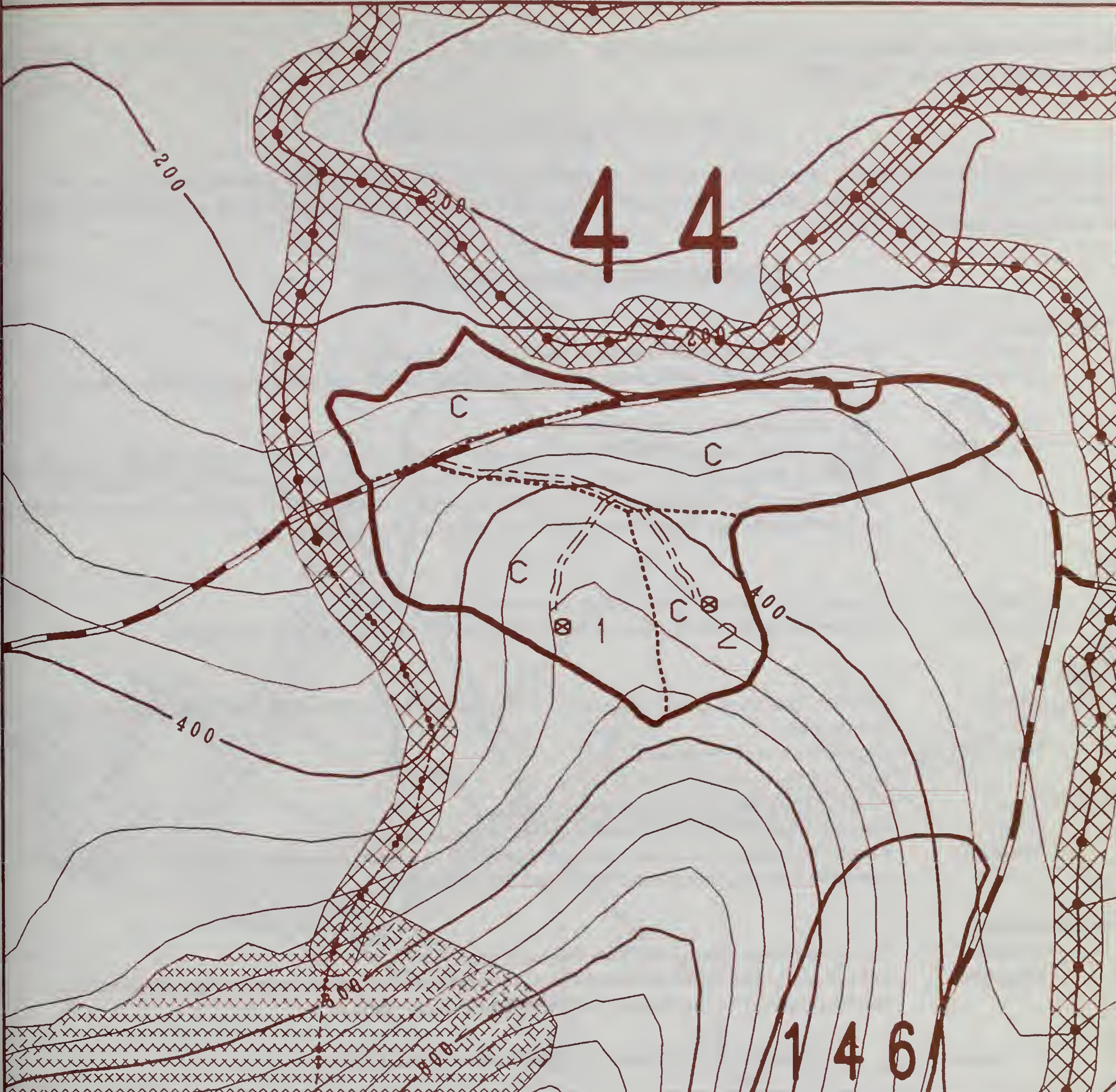
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	Monitor regeneration to determine if inter-planting of Alaska-cedar is needed		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a combination of shovel, high-lead yarding and mobile yarder. Temporary spur roads (0.4 miles) will be needed to provide access for highlead yarding on upper slopes. Mobile yarder would operate from existing road to yard the eastern and northwestern portions of unit.

AREA: S. LINDENBERG UNIT:44 ACRES:54 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 32A PHOTO#: 176-70

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 46 Acres: 31 ALT: 2,3,4,5
Net Sawlog Volume: 711 MBF VCU: 437

DEVELOPMENT OF UNIT BOUNDARY

The northwest boundary follows the rock pit and a Class III stream channel. The north boundary undulates in response to visual concerns. The east boundary follows a timber type change. The south and southwest boundaries are dictated by Class II streams and associated TTRA buffers.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located close to south and west boundaries.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffers and additional area to provide for a logical unit.
Concern:	Class III streams are located within unit.
Mitigation:	Require partial log suspension and split yarding to minimize impact to Class III streams. Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Do not cross Class III stream south of road with shovel yarder.

Soils

Concern:	A series of V-notches are located in the western portion of unit.
Mitigation:	Require partial log suspension over V-notch channels to minimize soil disturbance.

Wildlife

Concern:	Unit has 26 acres of good value marten habitat and 26 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0.5 to 1.0 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in middleground from Duncan Canal.
Mitigation:	Feather north, east and west boundaries above Road 6350 to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

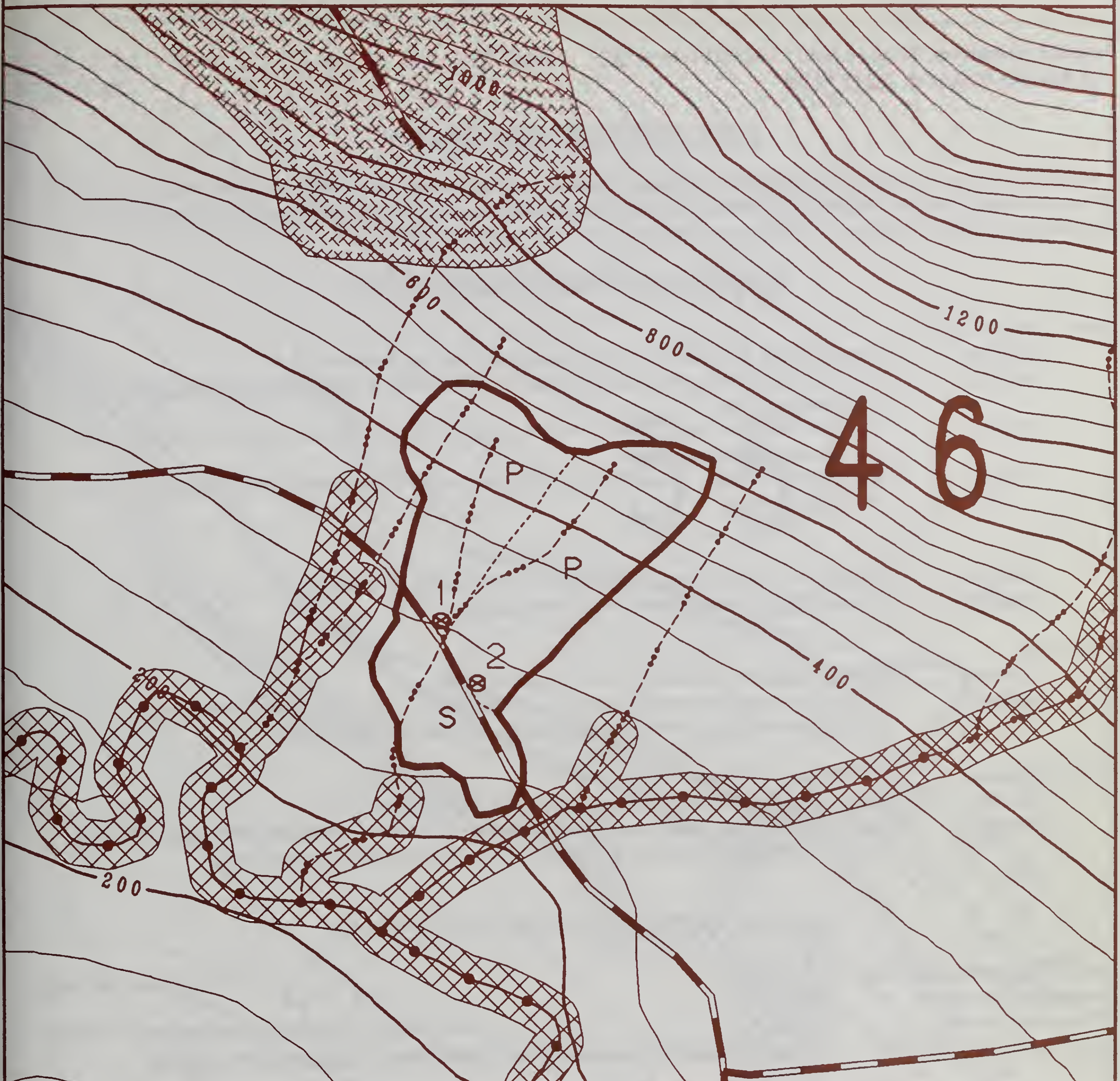
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a combination of shovel and slackline yarding. Slackline yarder would operate from existing roadway and provide partial log suspension and split-yarding of Class III streams. Shovel logging would occur on gentle slopes below road in southwest portion of unit.

AREA: S. LINDENBERG UNIT:46 ACRES:31 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 31A PHOTO#: 176-28

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 55 Acres: 54 **ALT: 2,3,4**
Net Sawlog Volume: 1,343 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary of this unit is undulated to eliminate "straight-line" appearance as viewed from Duncan Canal. A Class II stream TTRA buffer determines the southwest corner and southeast boundary. Southeast boundary follows Class III stream channel to northeast corner. Southwest boundary follows non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located in close proximity to southeast corner of unit.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer. Require directional falling away from stream buffer.
Concern:	Proposed temporary spur road would cross several Class III streams, which have an effect on downstream fish bearing water.
Mitigation:	Riprap culvert inlets and outlets. Avoid channel width changes and protect embankments with retaining structures.

Soils

Concern:	Upper slope is hummocky with occasional drops up to 100 percent.
Mitigation:	Unit boundary was located to avoid steep sections.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate three (3) reserve tree clumps (approximately 0.5 to 1.0) acre along setting breaks to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper portion of unit is seen in middleground from Duncan Canal.
Mitigation:	Upper (northeast) boundary was located irregularly to mimic natural openings on the hillside. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

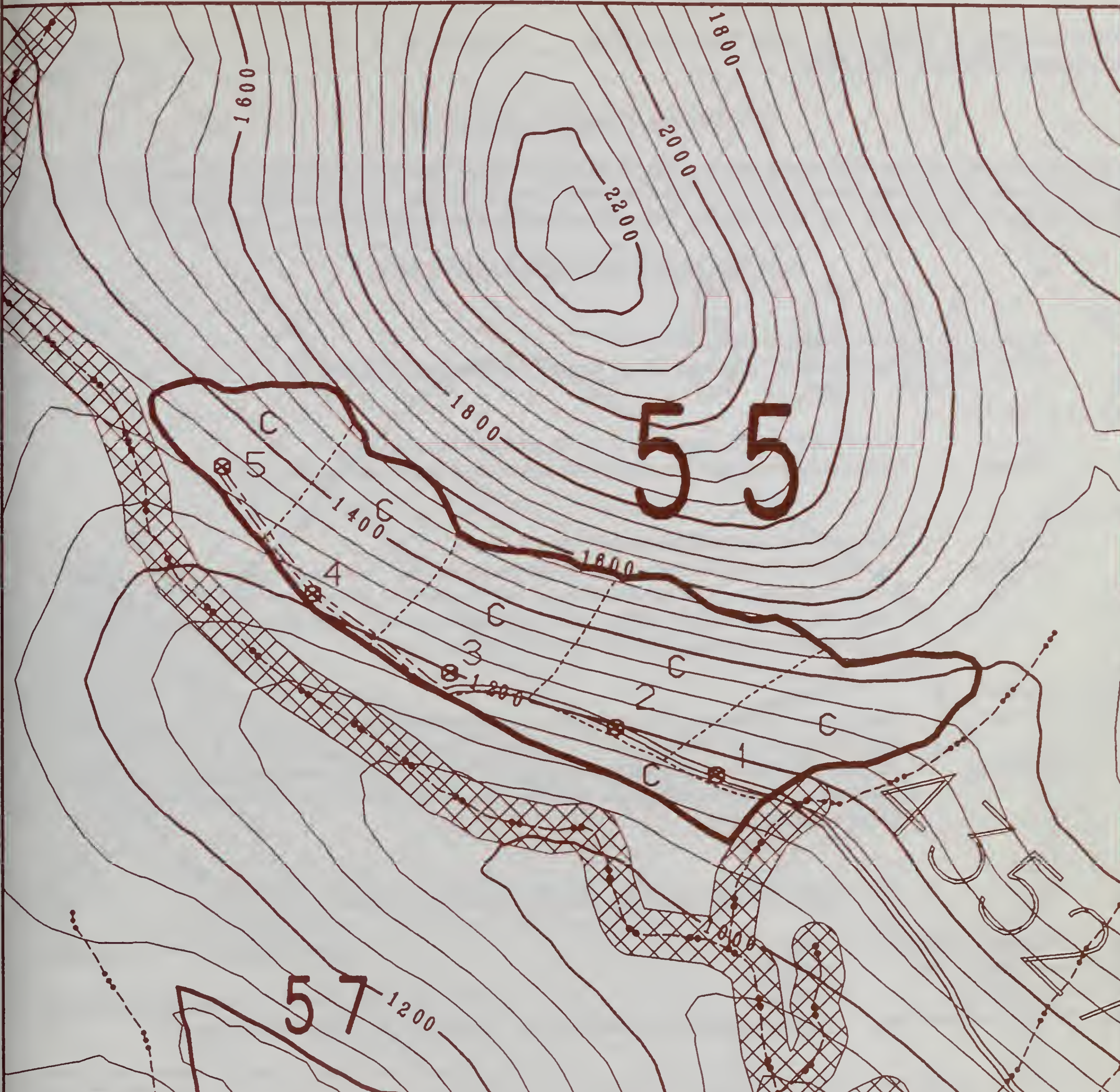
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 80 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for highlead yarding to five landings. Temporary road (approximately 0.3 miles) is needed to access two landings. Shovel logging is proposed south of road.

AREA: S. LINDENBERG UNIT:55 ACRES:54 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS	NON-USFS OWNERSHIP
PROPOSED FOREST DEVELOPMENT ROADS	MANAGED STANDS
PROPOSED TEMPORARY ROADS	LAKES
UNIT BOUNDARY	TTRA BUFFER FOR STREAMS/LAKES
SETTING BOUNDARIES	SALT WATER
CLASS 1 STREAMS	BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
CLASS 2 STREAMS	
CLASS 3 STREAMS	
⊗ 3 LANDINGS (NUMBERED)	

N

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 34A PHOTO#: 176-118

South Lindenberg Timber Sale Unit Number: 56M Acres: 70 ALT: 2,4
Net Sawlog Volume: 1,437 MBF VCU: 437

DEVELOPMENT OF UNIT BOUNDARY

This unit was extensively modified in response to concerns relating to Goshawks and visuals. Size was reduced from 111 acres to 70 acres. The south boundary follows the existing managed stand and Road 6354. The northeast boundary follows a ridge and logical slope break. The west boundary follows a setting boundary through commercial forest land.

RESOURCE CONCERNS AND MITIGATIONS

Soils

Concern:	Small slide is located within unit.
Mitigation:	Require partial log suspension on slopes above Roads 6354 and 43527.

TES Plants and Animals

Concern:	Portion of originally planned unit was in goshawk foraging area.
Mitigation:	Northwest settings were excluded from unit to leave sufficient foraging area.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate three (3) reserve tree clumps (approximately 0.5 to 1.0 acre) including one clump at setting break above existing rock pit and intersection of Road 6354 and proposed Road 43527; and two clumps at setting breaks along the upper (northeast) boundary. This treatment would provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper part of unit is seen in the middle ground from Duncan Canal. Unit was 111 acres as originally planned.
Mitigation:	Unit was redesigned to 70 acres to reduce visual impacts. Feather northeast and northwest boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

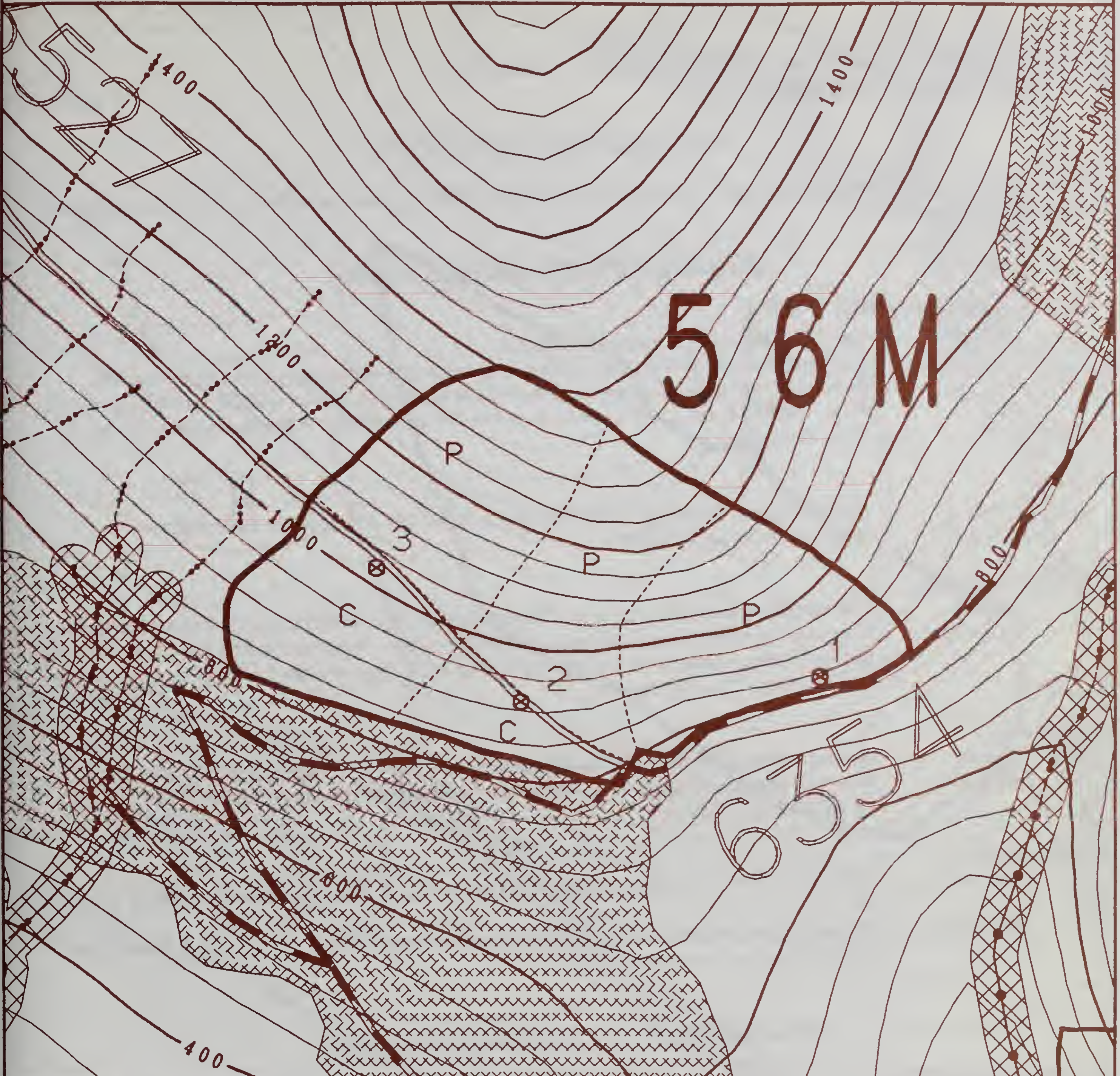
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 80 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for slackline yarding to three landings, two on proposed Road 43527 and one landing on existing Road 6359. Yarder should have the capability to provide partial log suspension.

AREA: S. LINDENBERG UNIT:56M ACRES:70 VCU: 437



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 34A PHOTO#: 176-119

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 57 Acres: 74 **ALT: 3**
Net Sawlog Volume: 217 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The northeast boundary follows a ridgetop. The remaining boundaries follow physical landmarks, such as V-Notches and timber type changes.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries
- Concern: One Class III stream is located within unit.
- Mitigation: Helicopter yarding will provide full log suspension and minimize disturbance to channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Require directional falling for Class III streams.

Wildlife
- Concern: Unit has 2 acres of average value Sitka black-tailed deer habitat in the eastern end.
- Mitigation: This concern is not mitigated.

TES Plant and Animal
- Concern: Harvest may disturb nesting Queen Charlotte goshawks, a former Category 2 candidate species.
- Mitigation: Nest searches will be conducted prior to implementation. If nesting activity has occurred during this time, harvesting activity and helicopter logging will be prohibited during the active nesting season (March 1 to August 15).

Biodiversity
- Concern: Harvest would eliminate old growth stand structure in harvested openings.
- Mitigation: Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources
- Concern: Harvest unit is seen in middleground from Duncan Canal. Unit was originally planned as a clear cut.
- Mitigation: Unit redesigned as group selection. Harvest approximately 11 acres in 1.5 to 2.5 acre groups distributed across the unit.

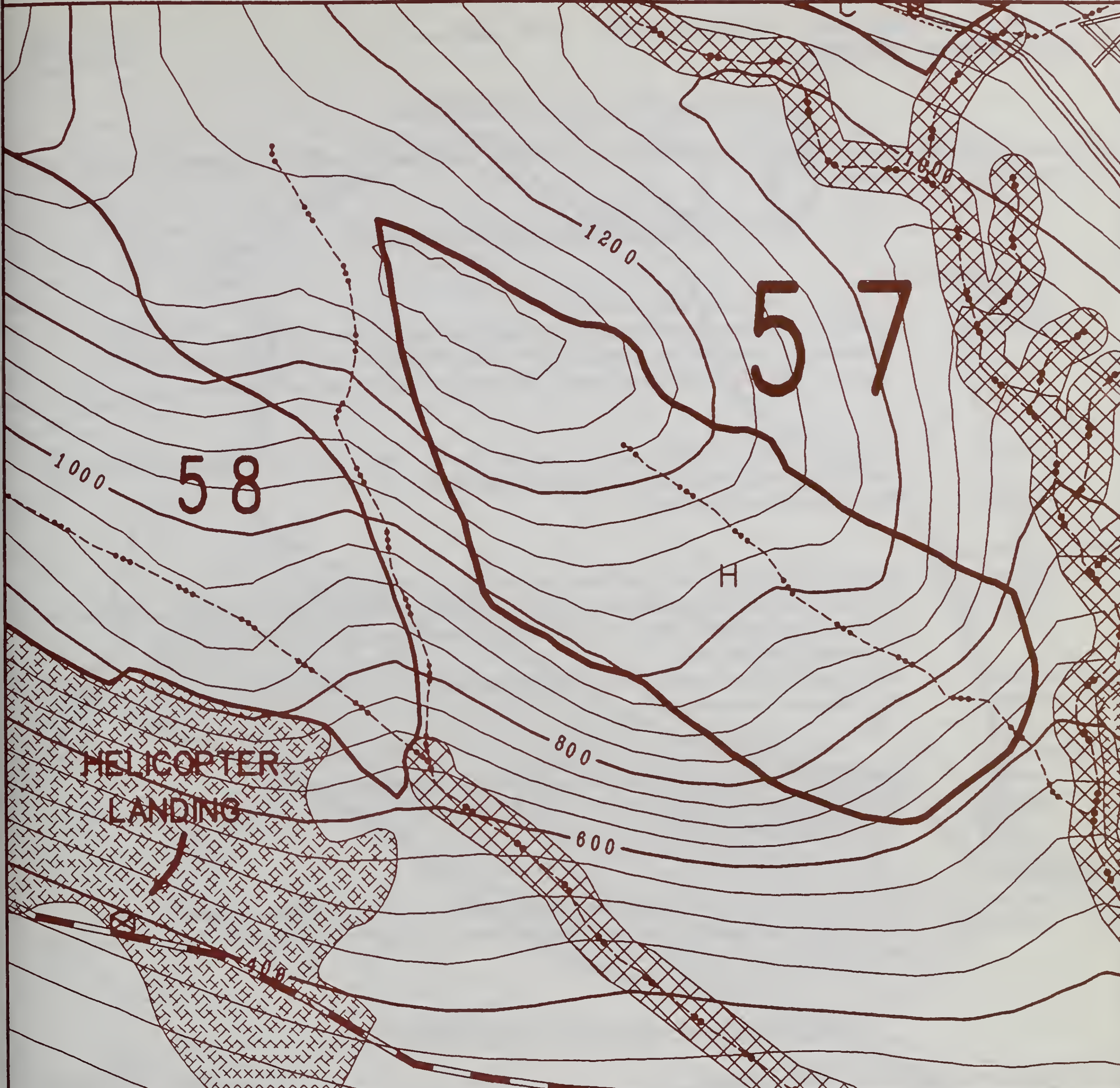
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Uneven Aged
Rotation Period: 160 years
Silvicultural Prescription: Group Selection
Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to a landing along Road 6350. Harvest would consist of several small groups between approximately 1.5 to 2.5 acres in size and would cover approximately 15 percent of the harvest unit. A clearcut prescription was originally considered, but would not meet visual quality objectives.

AREA: S. LINDENBERG UNIT:57 ACRES:74 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 34 PHOTO#: 176-243

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 58 Acres: 115 **ALT: 3,4**
Net Sawlog Volume: 571 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The southwest boundary follows a managed stand boundary. Remaining boundaries follow physical landmarks, such as streams and timber type changes.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class III stream is located within unit.
Mitigation:	Helicopter yarding will provide full log suspension, minimizing disturbance to understory vegetation. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Unit has 21 acres of average value marten habitat and 17 acres of average value Sitka black-tailed deer habitat in the southwestern and southeastern ends.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest unit is located within northern goshawk post-fledging area.
Mitigation:	Harvest 23 acres in groups (approximately 1.5 and 2.5 acres) distributed randomly throughout the unit, which will provide sufficient unharvested timber to meet 1992 Goshawk Interim Management Guidelines.
Concern:	Harvest may disturb nesting Queen Charlotte goshawks, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure in harvested openings.
Mitigation:	Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in the middleground from Duncan Canal. Unit was originally planned as clearcut.
Mitigation:	Unit redesigned as group selection. Harvest approximately 23 acres in 1.5 to 2.5 acre groups distributed through the unit.

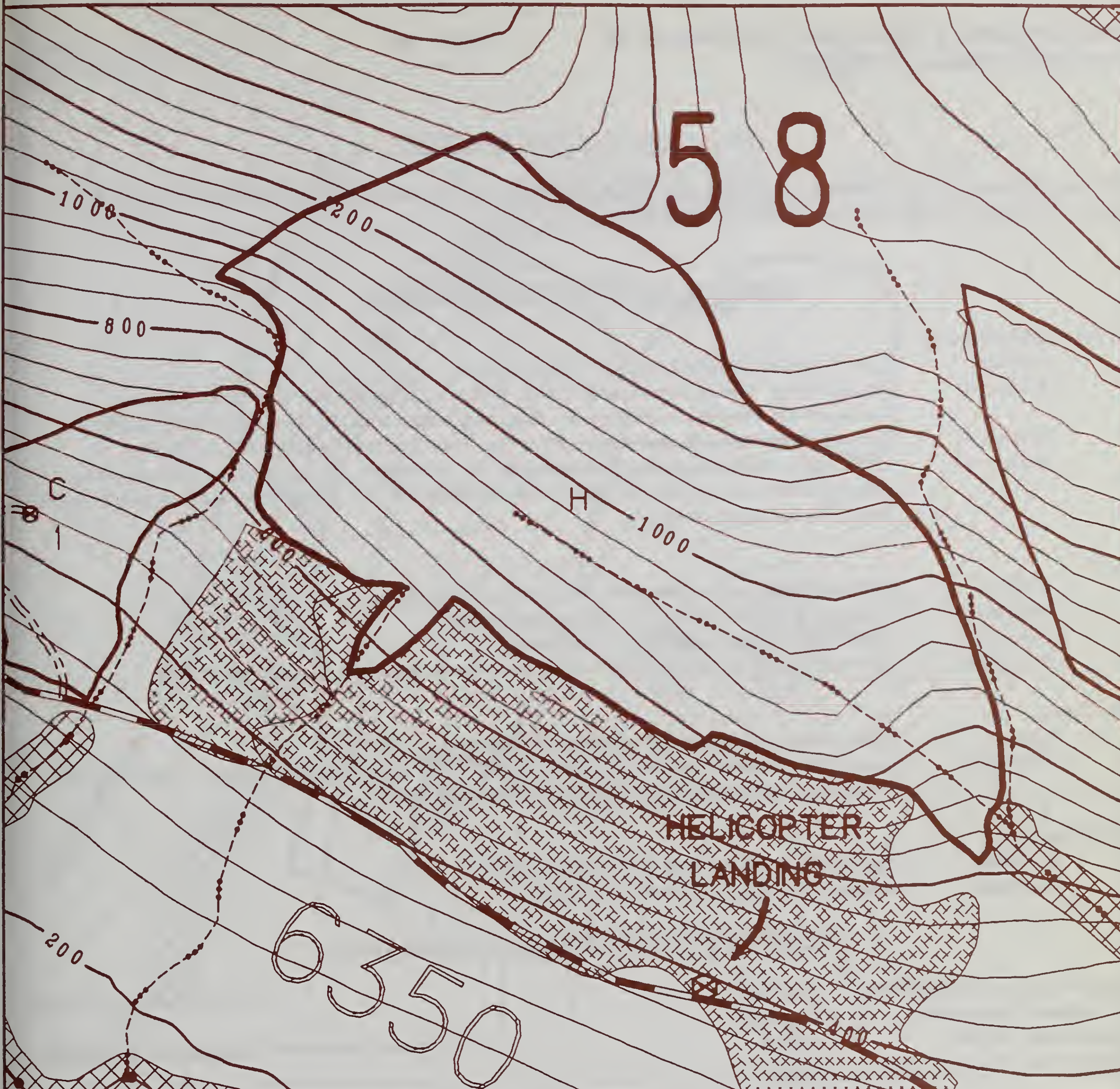
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Uneven Aged	Rotation Period:	160 years
Silvicultural Prescription:	Group Selection		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding. Landing would be located along Road 6350. Harvest would consist of several small groups between 1.5 and 2.5 acres in size and would cover approximately 20 percent of the harvest unit. Locate one group along Class III stream that extends into managed stand to recover windthrown timber. Unit was originally considered for clearcutting, but would not meet visual quality objectives or Goshawk Interim Management Guidelines.

AREA: S. LINDENBERG UNIT:58 ACRES:115 VCU: 437



	EXISTING FOREST DEVELOPMENT ROADS		NON-USFS OWNERSHIP
	PROPOSED FOREST DEVELOPMENT ROADS		MANAGED STANDS
	PROPOSED TEMPORARY ROADS		LAKES
	UNIT BOUNDARY		TTRA BUFFER FOR STREAMS/LAKES
	SETTING BOUNDARIES		SALT WATER
	CLASS 1 STREAMS		BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
	CLASS 2 STREAMS		
	CLASS 3 STREAMS		
⊗ 3	LANDINGS (NUMBERED)		

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 34 PHOTO#: 176-243

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 60 Acres: 66 ALT: 2,3,4,5
Net Sawlog Volume: 1,150 MBF VCU: 437

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows a bench and excludes the 100-ft. TTRA buffer. The east boundary excludes steep unstable slopes. The north boundary follows non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located close to west boundary.
Mitigation:	Unit boundary is located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel. Require directional falling away from TTRA buffer.
Concern:	Temporary spur road needed to access this unit would require crossing a Class II stream.
Mitigation:	Limit road construction activity between May 15 and August 15. Temporary bridge would be removed after use. Do not interrupt the natural migration of trout and other resident fish for more than seven consecutive days.

Soils

Concern:	Steep unstable slopes are located along east unit boundary.
Mitigation:	Boundary is located to exclude steep unstable areas.
Concern:	Landslide is located south of south boundary.
Mitigation:	Recommend use of mobile yarder to avoid constructing landing at south end of unit.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate three reserve tree clumps (approximately 0.5 to 1.0 acre) at setting breaks to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in background from Duncan Canal.
Mitigation:	Boundary undulates to reduce angular edge.

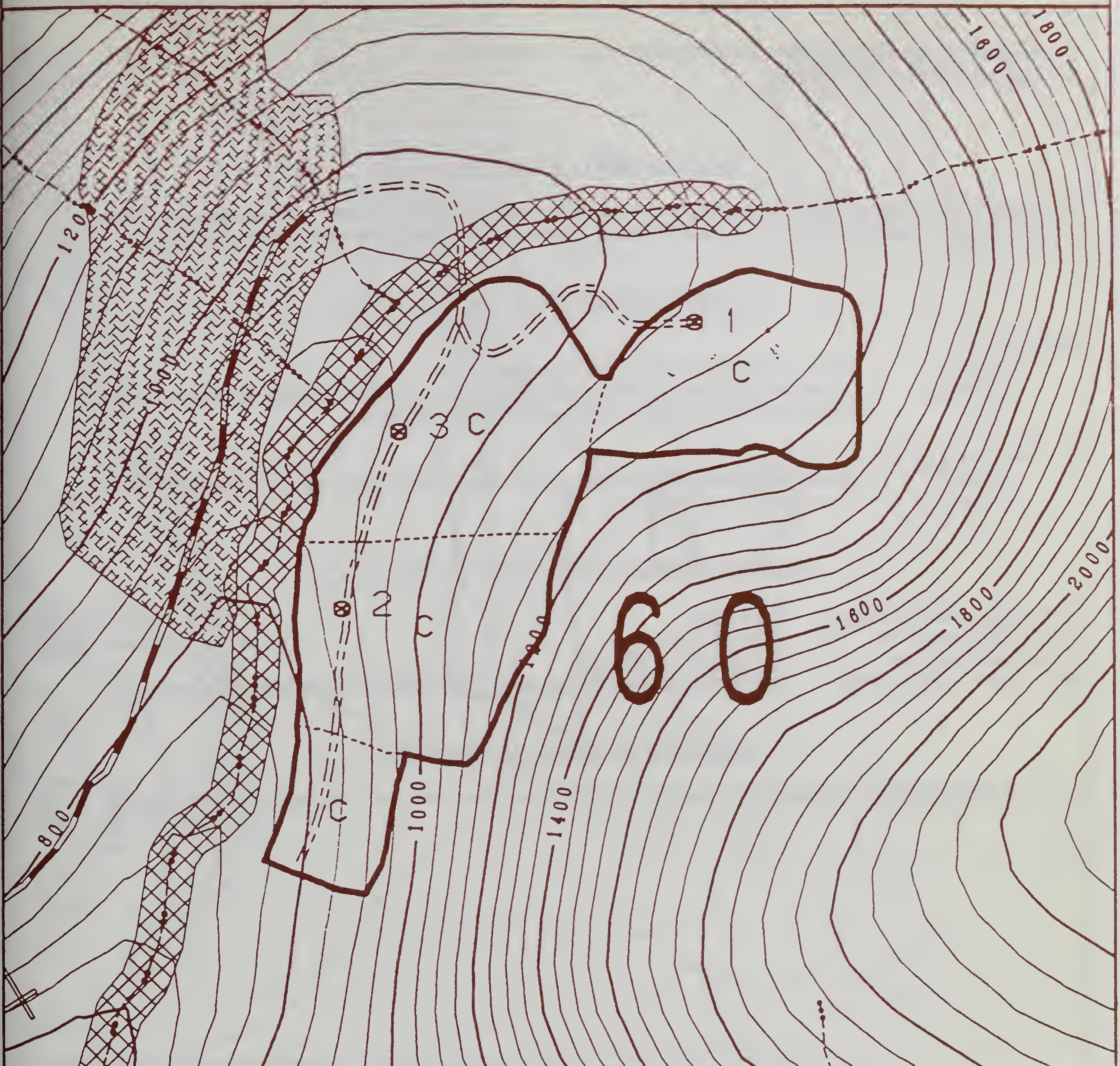
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to three landings. Mobile yarder is recommended for the south end of unit. Two temporary spur roads (total length of 0.9 miles) would be needed to access landings and mobile yarder access.

AREA: S. LINDENBERG UNIT:60 ACRES:66 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 35 PHOTO#: 176-131

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 62 Acres: 16 **ALT: 2,3,4,5**
Net Sawlog Volume: 367 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows edge of managed stand. The east boundary follows a natural break at a ridgetop. South boundary follows a natural break above a Class III stream. The west boundary follows non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Leave one reserve tree clump (approximately 0.5 to 1.0 acre) at setting break to provide for structural diversity throughout the rotation life of the stand.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

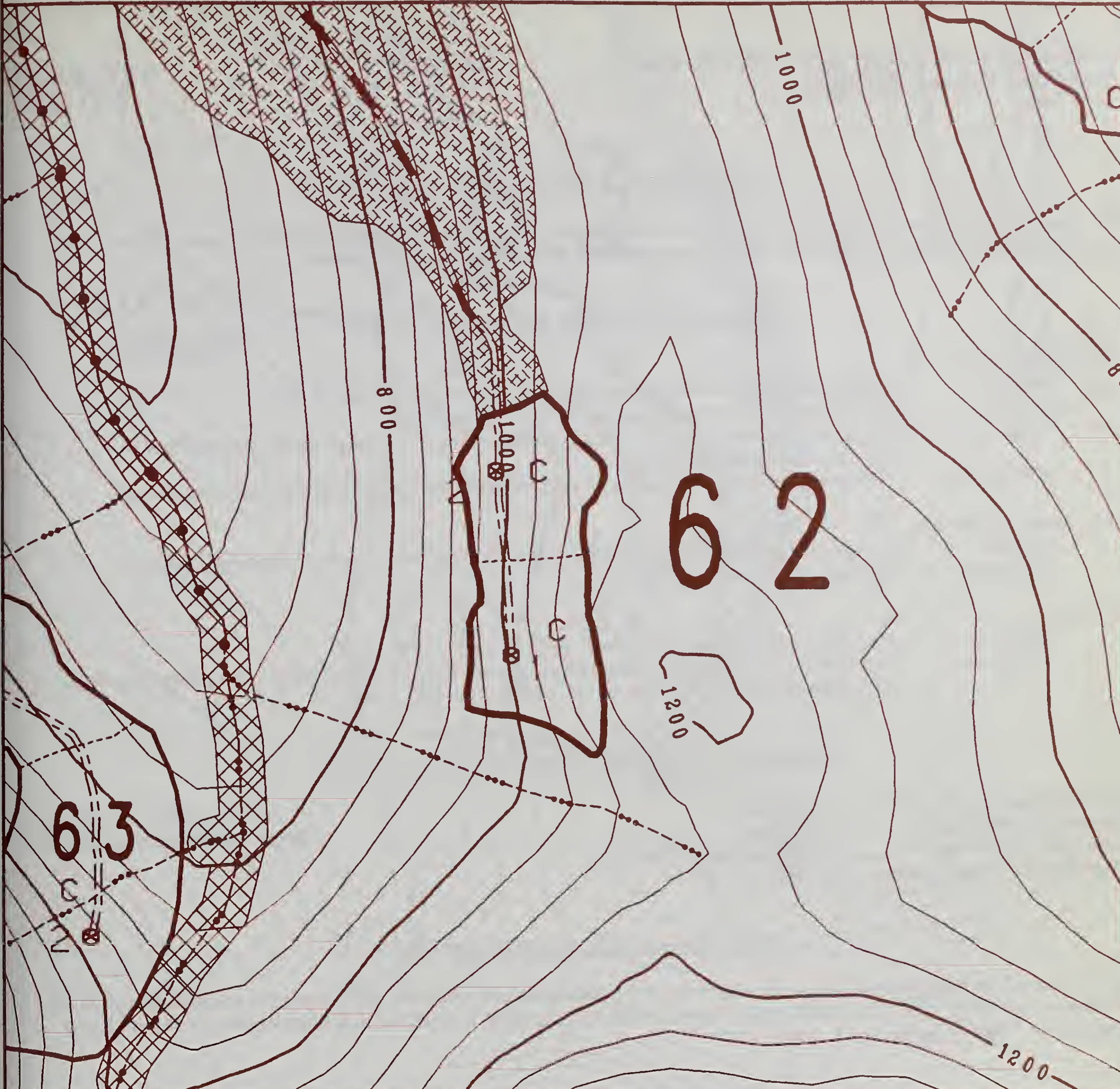
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	100 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed.		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for highlead yarding to two landings. A 0.2 mile temporary road would be needed to access landing.

AREA: S. LINDENBERG UNIT:62 ACRES:16 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-180

South Lindenberg Timber Sale Unit Number: 63 Acres: 36 ALT: 2,3,4,5
Net Sawlog Volume: 555 MBF VCU: 437

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follows a Class II TTRA buffer and muskeg to edge of managed stand at northwest corner of unit. The upper (west) boundaries are dictated by setting break with Unit 64 to be yarded by helicopter.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located in close proximity to southeast corner of unit.
Mitigation:	Unit boundary is located to exclude 100-ft. TTRA buffer.
Concern:	Proposed temporary spur road crosses several Class III streams, which have an effect on downstream fish bearing water.
Mitigation:	Riprap culvert inlets and outlets. Avoid channel width changes and protect embankments.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate one (1) reserve tree clump (approximately 0.5 to 1.0 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

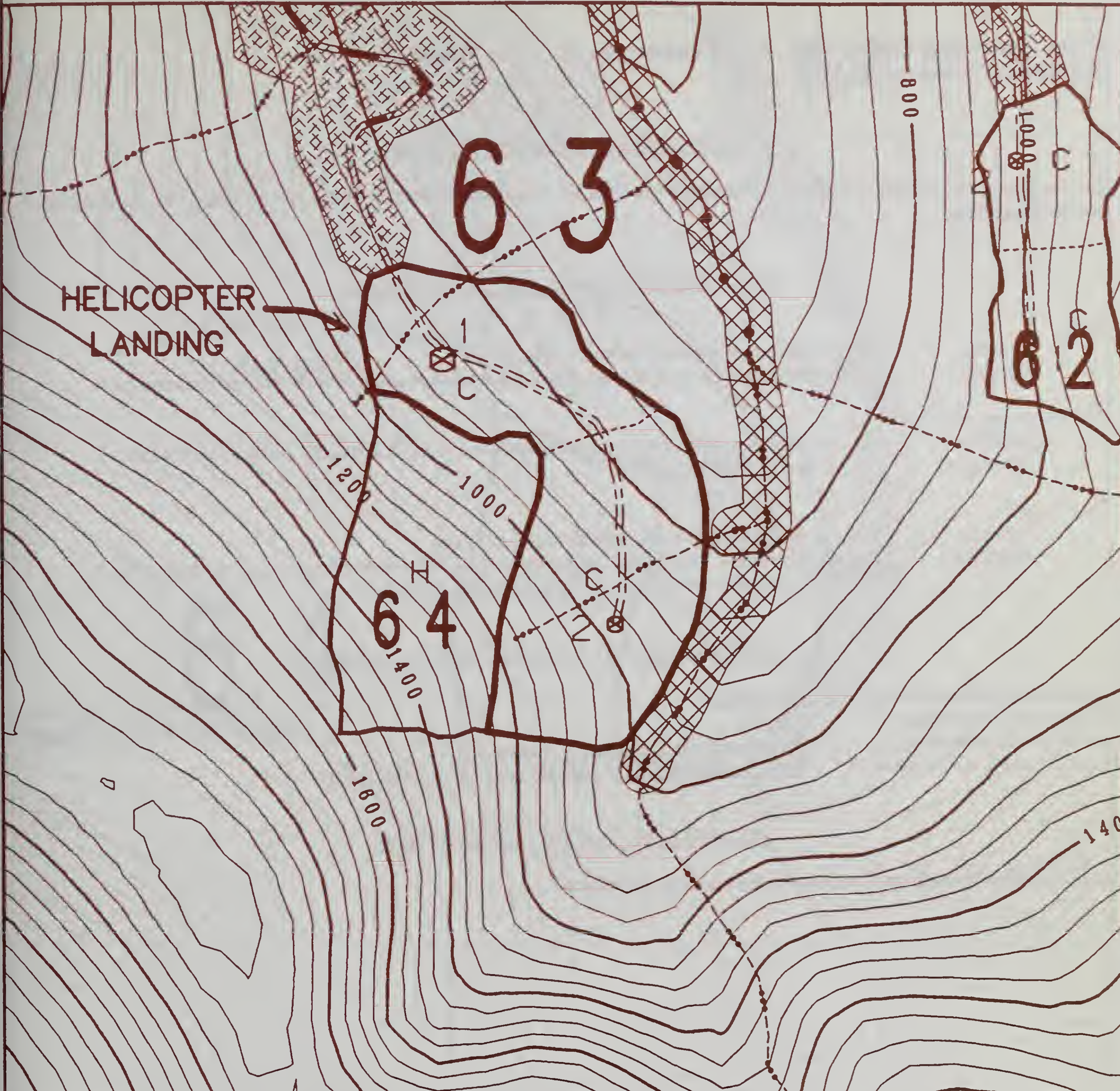
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 100 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	None	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings. A 0.5 mile temporary road would be needed to access landings. A 48 inch culvert would be needed to cross Class III stream at MP 0.2. Landing 1 would be used to helicopter yard Unit 62 and would cover 1 acre (Alternatives 3, 4 and 5).

AREA: S. LINDENBERG UNIT:63 ACRES:36 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 35 PHOTO#: 176-127

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale **Unit Number:** **64** **Acres:** **21** **ALT:** **3,4,5**
Net Sawlog Volume: **484 MBF** **VCU:** **437**

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follows the common boundary with Unit 63. Upper boundaries exclude over steepened slopes and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Soils

Concern: Slopes exceed 60 percent in some areas of unit.
Mitigation: Helicopter logging would achieve full log suspension and minimize ground disturbance.

TES Plants and Animals

Concern: Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.
Mitigation: Locate two reserve tree clumps (approximately 0.5 to 1.0 acre) within unit to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

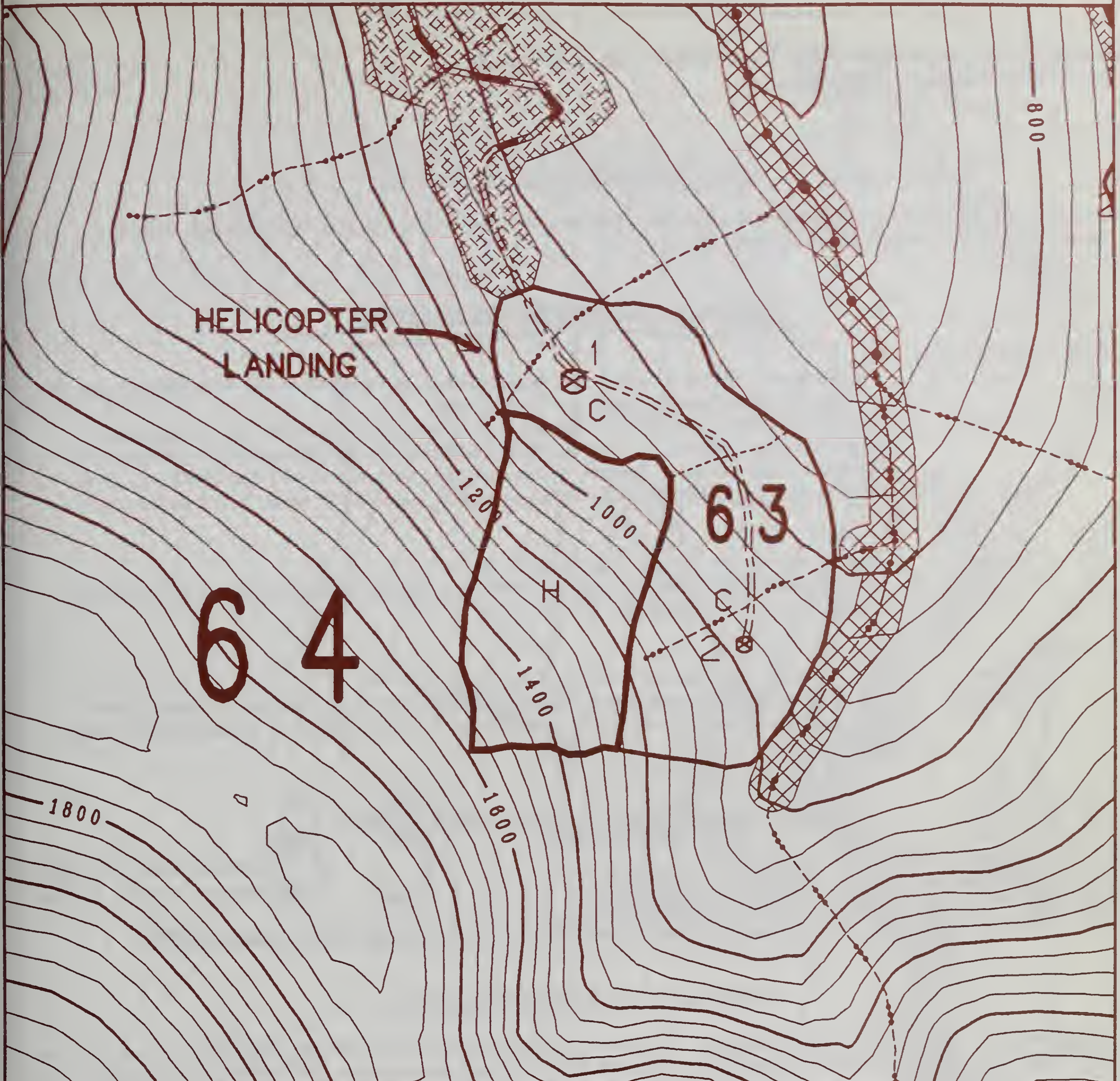
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Alaska-cedar decline in unit; do not plant Alaska-cedar.

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to the Landing 1 in Unit 63.

AREA: S. LINDENBERG UNIT:64 ACRES:21 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 35 PHOTO#: 176-127

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 65 Acres: 34 **ALT: 2,3,4,5**
Net Sawlog Volume: 838 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

Both the north and south boundaries follow V-notches. The west boundary follow non-commercial forest. The east boundary follows a common boundary with Unit 66.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Upper reaches of Class III streams are located within unit; stream network is temperature-sensitive in its lower reaches, during warm, low-flow periods.
Mitigation:	Helicopter yarding would achieve full log suspension and minimize damage to understory vegetation near channels. Require directional falling from Class III channels to maintain non-merchantable tree canopy. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Large V-notches are located along unit boundaries.
Mitigation:	Do not harvest trees within inner gorges. Helicopter yarding would achieve full log suspension, minimizing ground disturbance.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate four (4) reserve tree clumps (approximately 0.5 to 1.0 acre) to provide for structural diversity throughout the rotation life of the stand. Use natural breaks in the landscape to locate clumps.

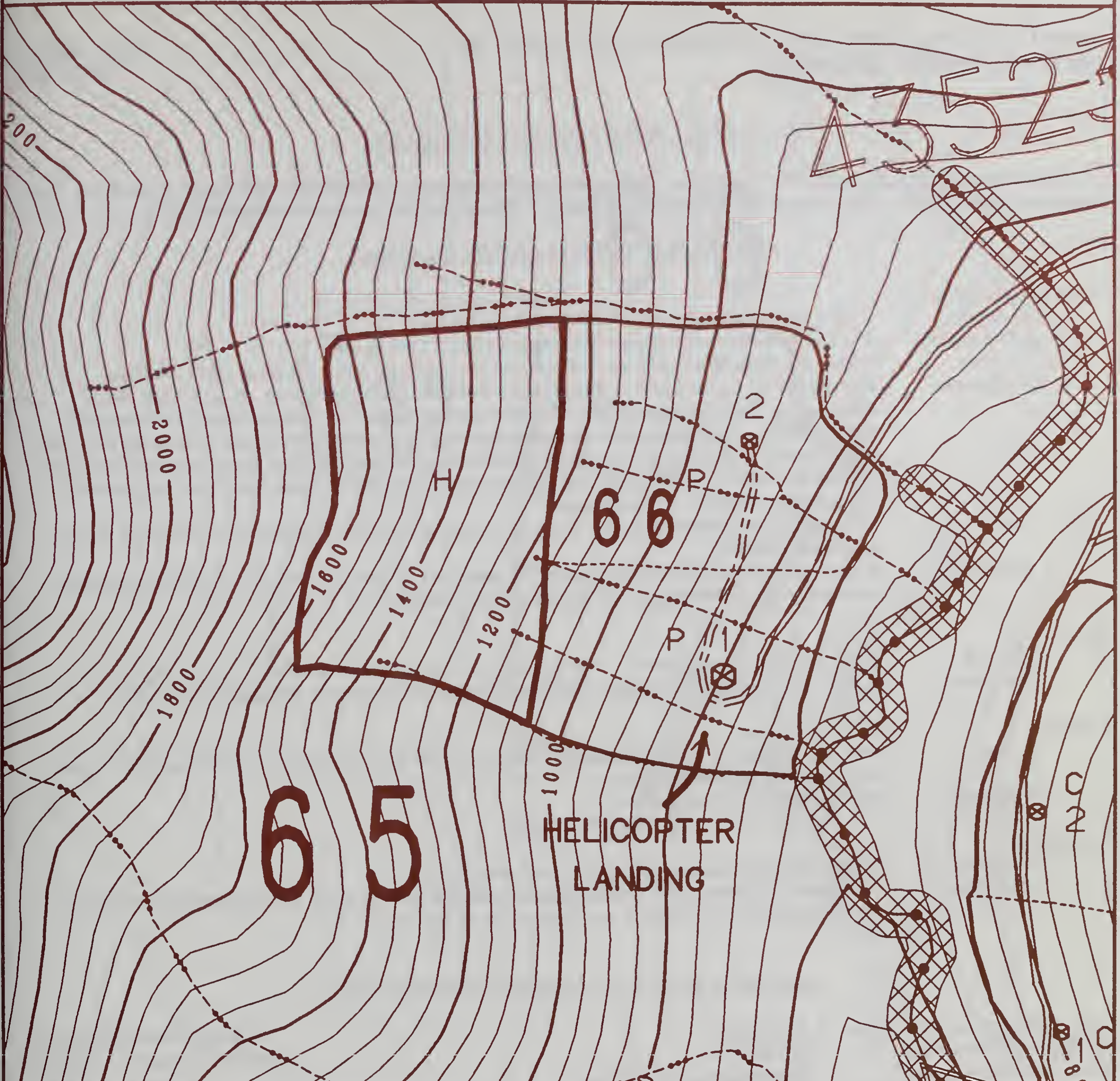
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 100 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 1 in Unit 66. The planned size of this unit was originally 65 acres, but was reduced to 34 acres to reduce the cumulative size of Units 65 and 66 to less than 100 acres. The deferred area could be accessed by helicopter logging in a future entry.

AREA: S. LINDENBERG UNIT:65 ACRES:34 VCU: 437



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-177

South Lindenberg Timber Sale Unit Number: 66 Acres: 51 **ALT: 2,3,4,5**
Net Sawlog Volume: 1,226 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The south and north boundaries follow V-notches. The upper (west) boundary was located for cable logging feasibility and is common with Unit 65. The east boundary follows a portion of TTRA buffer and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I stream is located near southeast corner of unit.
Mitigation:	The unit boundary was located to exclude 100-ft. TTRA buffer.
Concern:	Numerous Class III streams dissect unit and drain directly into high value Class 1 habitat.
Mitigation:	Require partial log suspension and/or split yarding of Class III streams. Require directional falling away from stream channels. Restrict yarding operations between May 15 and August 15 to protect streams from potential sedimentation during egg incubation periods. Maximize retention of understory vegetation in channel incisions to promote soil stability. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.
Concern:	Temporary road needed to access unit that crosses several Class III streams which drain directly into Class I stream.
Mitigation:	Restrict road construction to the period between May 15 and September 15 to prevent potential sedimentation of streams during egg incubation periods.

Soils

Concern:	Large V-notch channels are located in middle to northern portion of unit.
Mitigation:	Avoid yarding across channels or require partial log suspension to maintain soil stability.

Wildlife

Concern:	Unit has 10 acres of good value marten habitat and 10 acres of average value Sitka black-tailed deer habitat in the eastern end.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acre) at setting break to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 100 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings. Partial log suspension would be necessary over several Class III stream channels.

AREA: S. LINDENBERG UNIT:66 ACRES:51 VCU: 437

- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)

N

- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-177

South Lindenberg Timber Sale Unit Number: 67 Acres: 28 ALT: 2,4,5
Net Sawlog Volume: 501 MBF VCU: 437

DEVELOPMENT OF UNIT BOUNDARY

The east boundary is affected by the location of a Class II stream. The south boundary follows a V-Notch channel. The west boundary avoids steep slopes and shares a common boundary with Unit 145 (for Alternatives 2,4,5). The north boundary follows an existing managed stand and V-notch.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located along the east boundary.
Mitigation:	The east boundary was located to exclude 100-ft. TTRA buffer.
Concern:	Class III streams are located within harvest unit.
Mitigation:	Require partial log suspension and/or split yarding of Class III streams. Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Upper slopes within the original unit boundary included steep slopes up to 80%.
Mitigation:	Unit boundary was modified to exclude slopes greater than 70%.

Wildlife

Concern:	Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 12 acres of good value marten habitat in the western end, and 28 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate one (1) reserve tree clump (approximately 0.5 to 1.0 acre) at setting break to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Cumulative size of opening associated with Units 67, 68, 145, and existing harvested openings exceeds 100 acres. Unit is not seen from sensitive viewing areas.
Mitigation:	See mitigation for Units 68 and 145. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

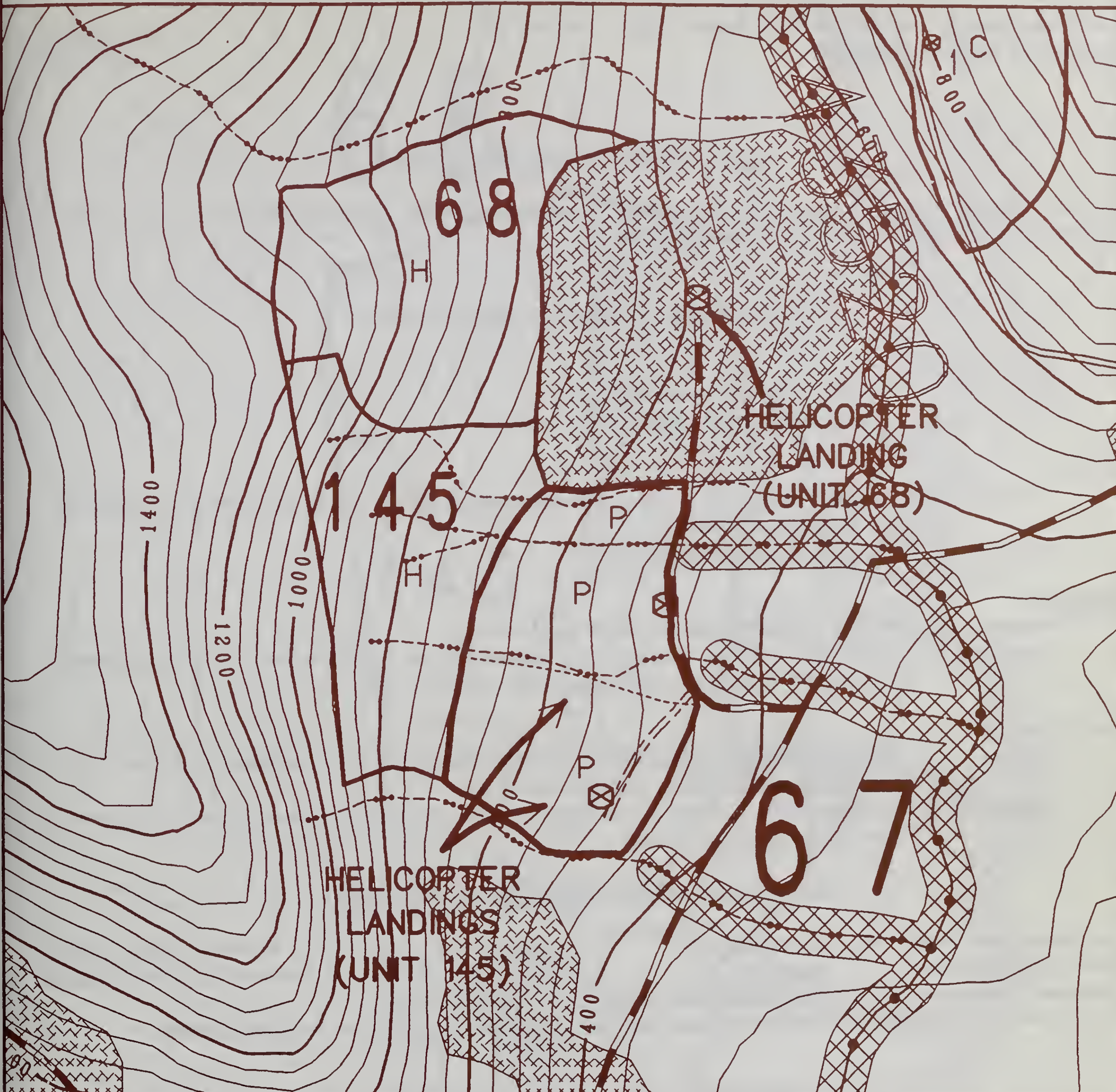
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 100 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	None	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for cable yarding to two landings. Recommend use of a mobile yarder in north setting to avoid yarding across Class III stream. Partial log suspension and split-yarding would be necessary to avoid impact to streams. Both landings could be used to helicopter yard Unit 145. One landing covering one acre would be sufficient for yarding logs from Unit 145.

AREA: S. LINDENBERG UNIT:67 ACRES:28 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED) 3

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg (Silviculturist) 3/10/95 (Date)

Reviewed By: Jeff Barrett (I.D. Team Leader) 3/10/95 (Date)

FLIGHT LINE: 36 PHOTO#: 176-178

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 68 **Acres: 28** **ALT: 2,4,5**
Net Sawlog Volume: 616 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a V-notch. The east boundary follows managed stand. The south boundary is common with Unit 145. The west boundary follows non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries
- Concern: Class III stream is located north of unit.
- Mitigation: Require directional falling away from stream.

Wildlife
- Concern: Unit has 4 acres of good value marten habitat and 6 acres of average value Sitka black-tailed deer habitat in the eastern end.
- Mitigation: This concern is not mitigated.

Biodiversity
- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acre) in west half of unit to provide for structural diversity throughout the rotation life of the stand.

Visual Resources
- Concern: The cumulative opening size of Units 67, 68, 145 and existing harvested opening exceeds 100 acres. Unit is not seen from sensitive viewing area.
- Mitigation: Feather west unit boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

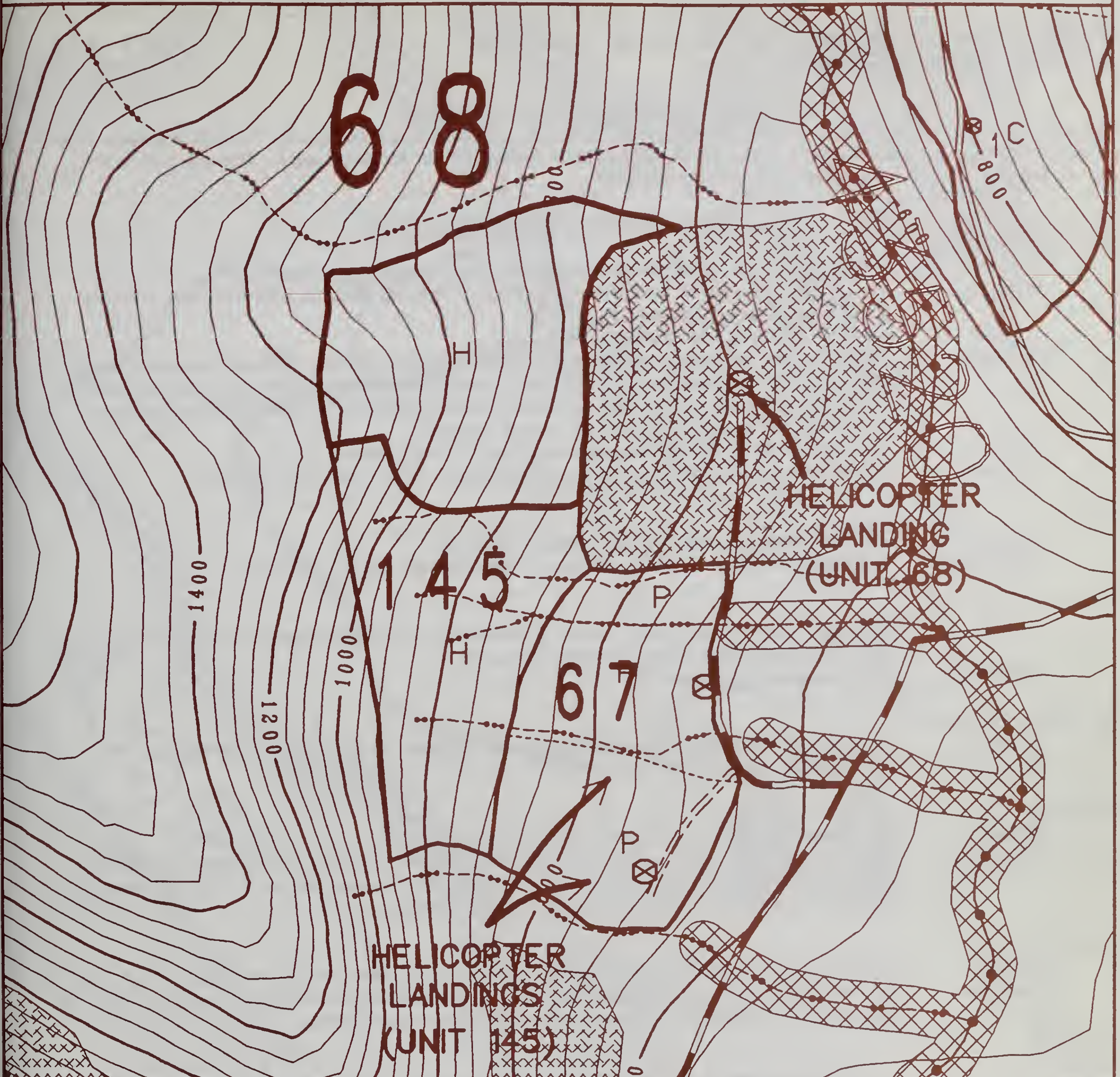
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to landing at end of road in managed stand east of Unit 68.

AREA: S. LINDENBERG UNIT:68 ACRES:28 VCU: 437



N

- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)

- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg	3/10/95
	Silviculturist	Date
Reviewed By:	Jeff Barrett	3/10/95
	I.D. Team Leader	Date
FLIGHT LINE: 36	PHOTO#:	176-178

South Lindenberg Timber Sale Unit Number: 69 Acres: 96 **ALT: 2,3,4,5**
Net Sawlog Volume: 3,323 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary is governed by a combination of Class II streams and non-commercial forest. The east boundary follows a Class II TTRA buffer and Class III stream. The upper boundary follows timber and slope break. The west boundary follows a logical slope break and scrub timber type change.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located close to north and east boundaries.
Mitigation:	Unit boundaries were located to exclude 100-ft. TTRA buffers, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams are located within unit.
Mitigation:	Require partial log suspension and split yarding of central V-notch. Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Minimize activities within the central stream channel.
Concern:	Temporary road is needed to cross central large V-notch channel.
Mitigation:	Construct temporary crossing utilizing 48 inch pipe. Remove structure after use.

Soils

Concern:	Inclusions of high hazard soil are located within unit.
Mitigation:	Require partial log suspension over upper slopes to minimize soil disturbance.

Wildlife

Concern:	Unit has 71 acres of good value marten habitat in the northern half and 31 acres of average value Sitka black-tailed deer habitat through the middle.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acres) to provide for structural diversity throughout the rotation life of the stand. Avoid locating clumps where there is potential for leave trees to blow down and fall into Class III streams.

Visual Resources

Concern:	Original planned unit size was 115 acres. Unit partially visible from Ravens Roost.
Mitigation:	Unit redesigned to 94 acres and the southwest and southeast unit corners were rounded. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 100 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed diversity.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned to be yarded with slackline yarding systems. A 0.5 mile temporary road will need to be constructed across central V-notch to provide access to two landings.

AREA: S. LINDENBERG UNIT:69 ACRES:96 VCU: 437

- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-180

South Lindenberg Timber Sale Unit Number: 71 Acres: 15 **ALT: 2,3,4,5**
Net Sawlog Volume: 338 MBF **VCU: 437/447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a Class III stream. The west and south boundaries follow non-commercial forest. The east boundary follows a logical setting break.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries
- Concern: Class III streams are located within unit.
- Mitigation: Require partial log suspension to minimize impact to Class III streams. Require directional falling away from Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife
- Concern: Unit has 14 acres of good value marten habitat.
- Mitigation: This concern is not mitigated.

Biodiversity
- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Minimize disturbance to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

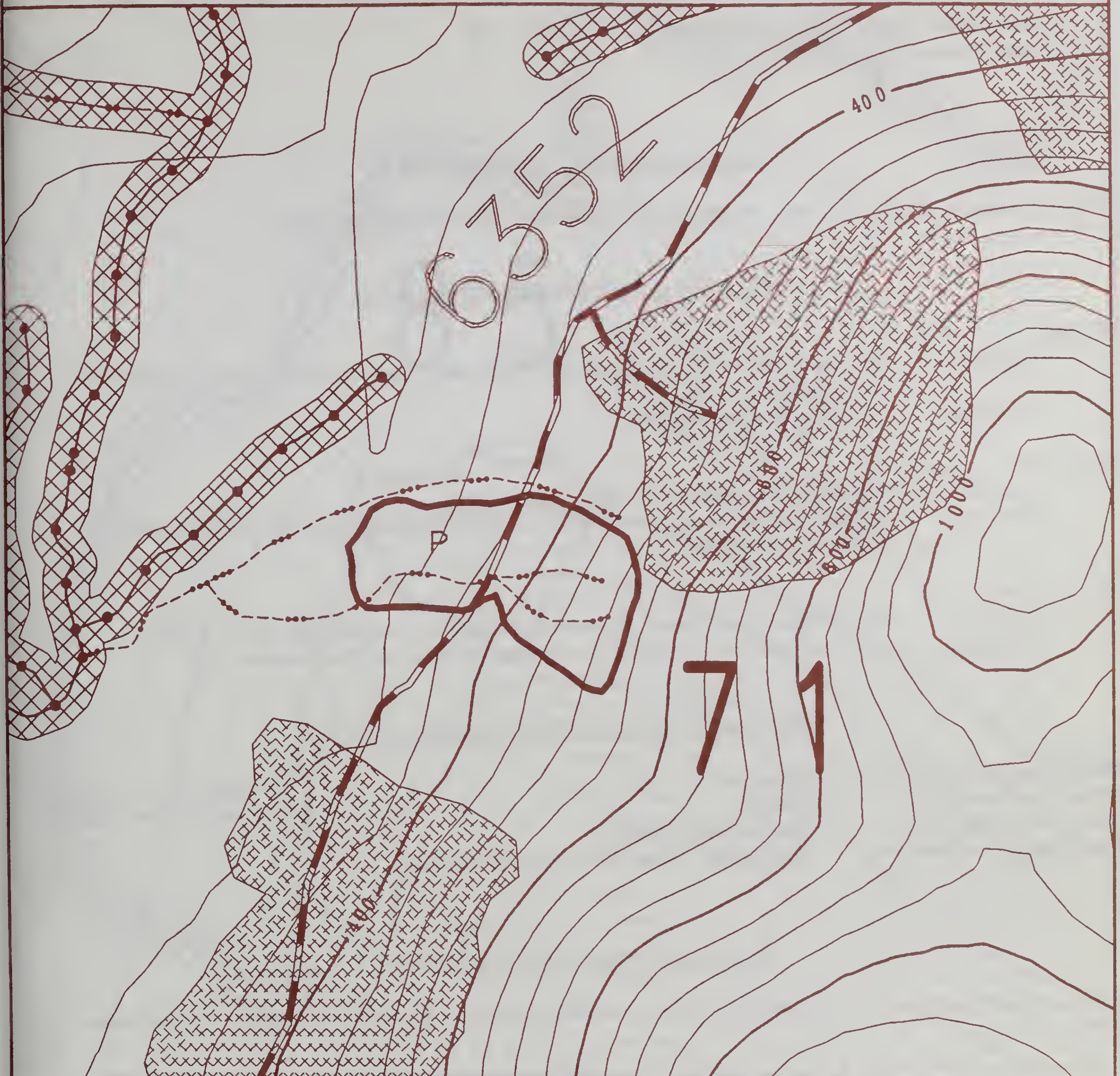
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Recommend mobile yarder to operate from existing Road 6352 to achieve partial log suspension and/or split yarding of streams and minimize disturbance to nonmerchantable trees.

AREA: S. LINDENBERG UNIT:71 ACRES:15 VCU: 447/437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 85 Acres: 13 **ALT: 3**
Net Sawlog Volume: 324 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a muskeg. The east and west boundaries follow logical slope breaks.

RESOURCE CONCERNS AND MITIGATIONS

Wildlife

Concern:	Unit has 13 acres of good value marten habitat and 12 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to nonmerchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in middleground from Wrangell Narrows. Originally planned as 39 acres.
Mitigation:	Unit was redesigned to 13 acres. Feather unit boundaries to reduce angular edge.

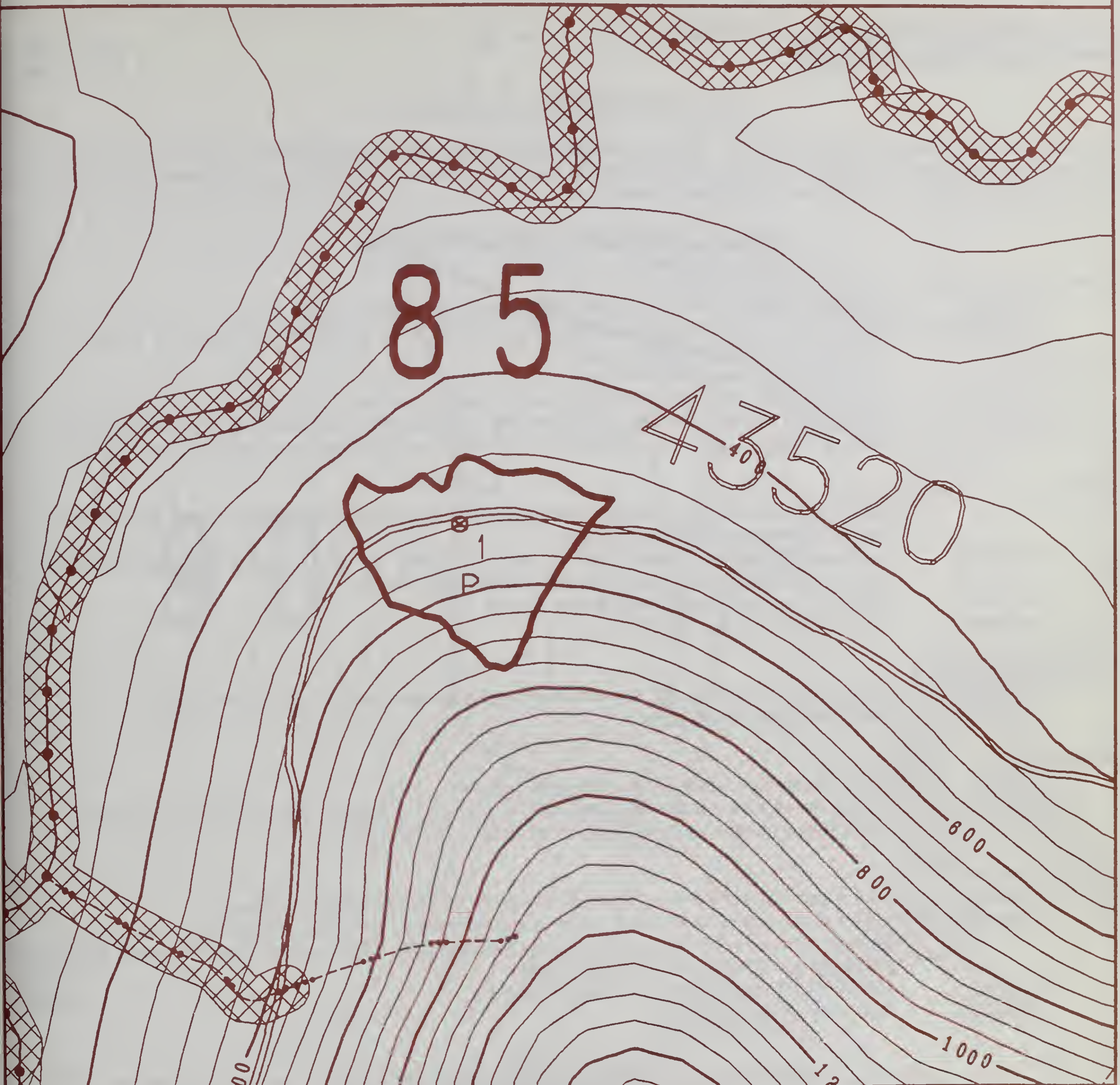
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 120 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Alaska-cedar decline; do not plant Alaska-cedar.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for logging by a mobile yarder to achieve partial log suspension and minimize damage to nonmerchantable trees.

AREA: S. LINDENBERG UNIT:85 ACRES:13 VCU: 447



N

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-174

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 90 Acres: 55 **ALT: 3,4**
Net Sawlog Volume: 1,372 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a Class III stream. The west boundary follows a logical yarding break and some inclusions of non-commercial forest. The south boundary follows a dormant slide and second-growth timber. The east boundary follows Class II TTRA buffers and muskeg/non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located close to the bottom (east) portion of unit.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer strip, plus additional area to reduce sedimentation into the stream channel.
Concern:	Several Class III streams dissect unit
Mitigation:	Require partial log suspension and/or split yarding of streams. Require directional falling away from Class III stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Red-tailed and sharp-shinned hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 39 acres of good value marten habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0.5 to 1.0 acres) to retain a legacy of old growth stand; locate clumps on upper slopes; including one at setting break.

Visual Resources

Concern:	Unit is partially visible from Wrangell Narrows. Originally planned as 83 acres.
Mitigation:	Unit was redesigned to 55 acres. Leave clump of trees on spur ridge in southwest corner of unit. Feather west and south boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.
Concern:	Unit has 39 acres of good value marten habitat.
Mitigation:	This concern is not mitigated.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Slackline yarder is proposed to achieve yarding distance and partial log suspension.
Three landings would be required.

AREA: S. LINDENBERG UNIT:90 ACRES:55 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg (Silviculturist) — 6/06/95 (Date)

Reviewed By: Ron Bockelman (I.D. Team Leader) — 6/06/95 (Date)

FLIGHT LINE: 34A PHOTO#: 176-117

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 93 Acres: 23 ALT: 3,4
Net Sawlog Volume: 359 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The south boundary follows a Class II stream TTRA buffer and Class III stream. The south boundary follows a Class II TTRA buffer. The west boundary follows a logical yarding break and is common with the east boundary of Unit 94. The northeast-east boundary follows a Class III stream, Class III TTRA buffer and muskeg/non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II streams are located close to northeast and south boundaries.
Mitigation:	Unit boundary is located to exclude 100-ft. TTRA buffer. Require directional falling away from buffer.
Concern:	Class III stream channels are located close to the north and south boundaries.
Mitigation:	Require directional falling away from stream channels.
Concern:	Temporary road needed to access unit crosses several Class II and III streams.
Mitigation:	Restrict road construction activities to the period between May 15 and September 15 to prevent potential sedimentation of streams during egg incubation periods. Riprap culvert inlets and outlets. Avoid channel width changes and protect embankments with retaining structures.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Originally planned cumulative size of harvested opening (in conjunction with Unit 94) was 98 acres.
Mitigation:	Unit was redesigned from 38 to 23 acres to reduce cumulative size of Units 93 and 94 to 48 acres.

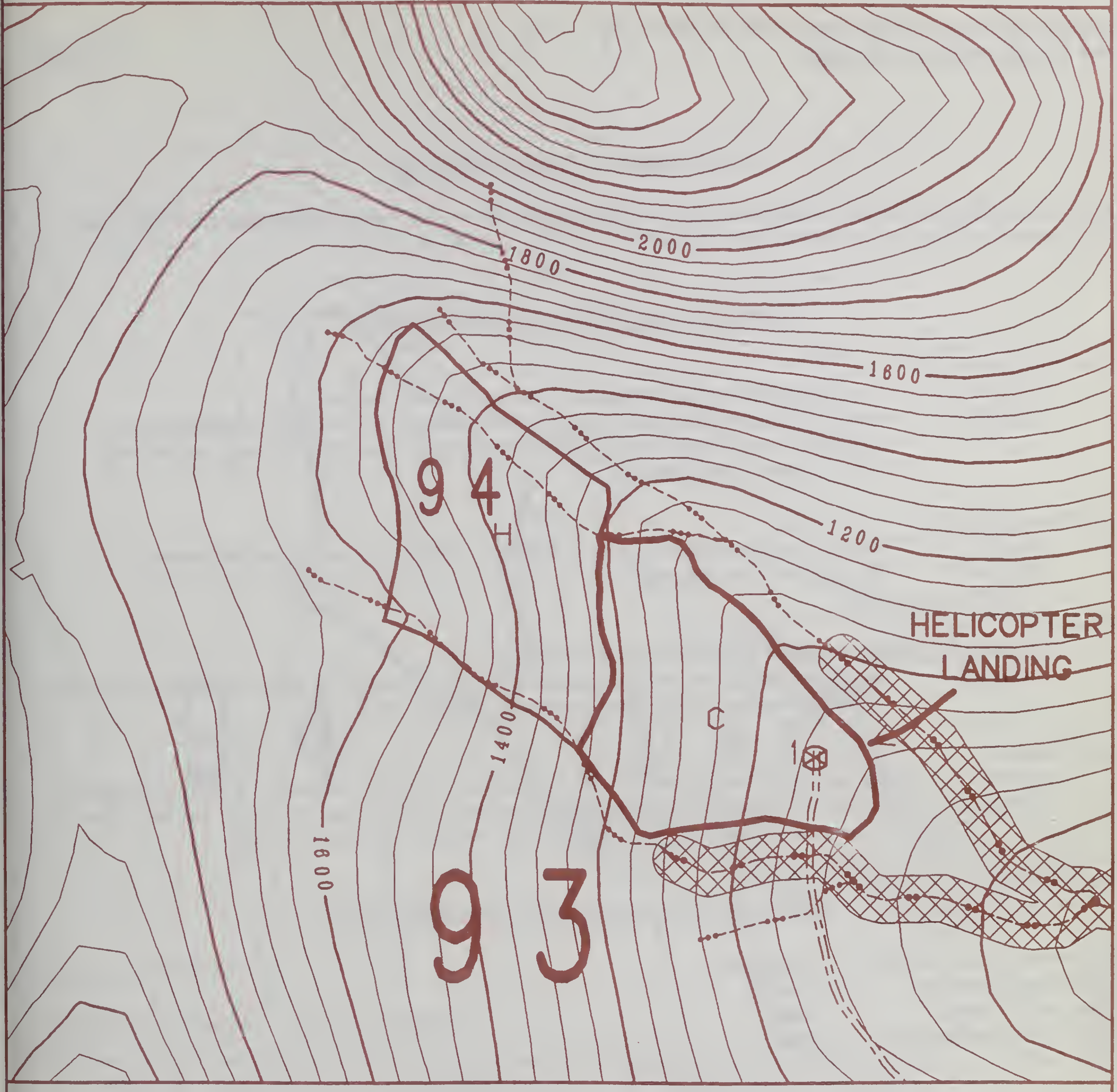
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 110 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Interplant western redcedar. Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for highlead yarding to one landing. A 1.0 mile temporary road would be needed to access landing. The following structures would be required for stream crossings: MP 0.3 - 48 inch pipe, MP 0.4 - 60 inch pipe, MP 0.6 - 35 ft. bridge, MP 0.7 - 48 inch pipe, MP 0.8 - 96 inch pipe, MP 0.8 - 55 ft. bridge, MP 0.9 - 72 inch pipe, 48 inch pipe, 48 inch pipe. Landing would be used as helicopter landing for Unit 94 and would cover 1 acre.

AREA: S. LINDENBERG UNIT: 93 ACRES: 23 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 34A PHOTO#: 176-117

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 94 Acres: 25 **ALT: 3,4**
Net Sawlog Volume: 524 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

Both the northeast and southwest boundaries follow Class III streams. The west boundary follows non-commercial forest. The east boundary follows the west boundary of Unit 93.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class III streams are located adjacent to north and south boundaries.
Mitigation:	Require directional falling away from Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two reserve tree clumps (approximately 0.5 to 1.0 acres) on upper slopes of unit to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	The originally planned cumulative size of opening (in conjunction with Unit 94) was 98 acres.
Mitigation:	Unit was redesigned from 38 to 25 acres to reduce cumulative size of Units 93 and 94 to 49 acres. Reserve tree clumps proposed for biodiversity will also reduce visual impacts

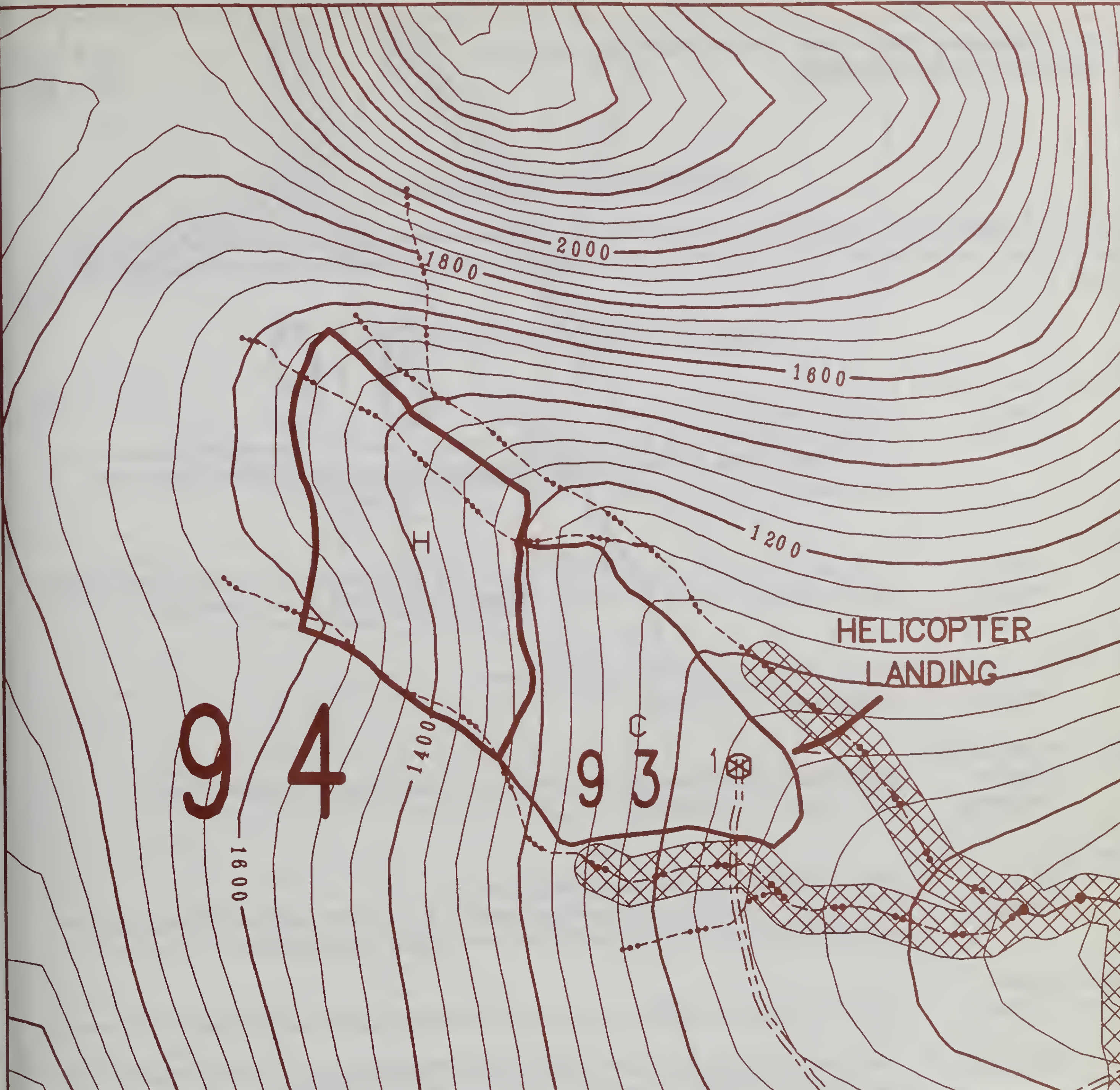
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 1 in Unit 93.

AREA: S. LINDENBERG UNIT:94 ACRES:25 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 34A PHOTO#: 176-117

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 96 Acres: 12 **ALT: 3,4**
Net Sawlog Volume: 308 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows muskeg and non-commercial forest. The west boundary follows a logical slope break. The south boundary follows a logical slope break and excludes oversteepened slopes. The east boundary follows a Class III stream.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Several Class III streams are located within unit.

Mitigation: Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern: Southwest portion of originally planned unit showed numerous scars from previous slide activity.

Mitigation: Unit boundary was located to exclude, steep and potentially, unstable areas from unit.

Wildlife

Concern: Unit has 11 acres of good value marten habitat.

Mitigation: This concern is not mitigated.

TES Plants and Animals

Concern: Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acres) along setting break between Landings 1 and 2 to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: The originally planned cumulative size of harvested opening (in conjunction with Unit 97) was 53 acres.

Mitigation: Unit was redesigned from 24 to 12 acres to reduce the cumulative size of Units 96 and 97 to 23. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

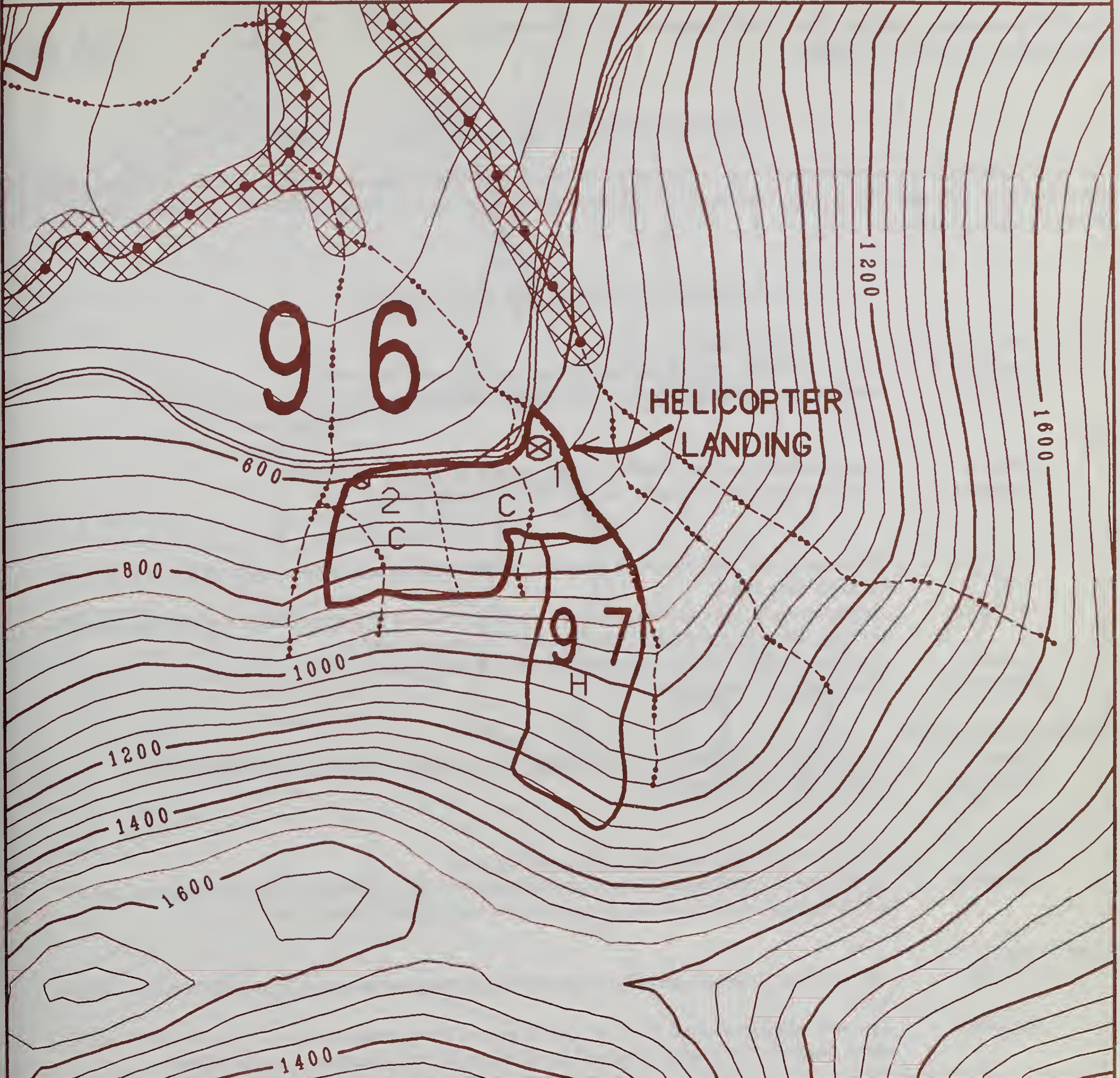
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings. Landing 2 would be used as a helicopter landing for yarding Unit 97 and would cover 1 acre.

AREA: S. LINDENBERG UNIT:96 ACRES:12 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 35 PHOTO#: 176-133

South Lindenberg Timber Sale Unit Number: 97 Acres: 11 **ALT: 3,4**
Net Sawlog Volume: 274 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows the edge of steep slopes and an old slide. The south boundary follows edge of non-commercial forest and oversteepened slopes. The north boundary follows logical slope break common to Unit 96. The east boundary follows a Class III stream.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Several Class III streams parallel the east and west unit boundaries.
Mitigation:	Require directional falling away from channel incisions.

Soils

Concern:	Steep unstable area was located in west portion of original unit layout.
Mitigation:	Unit boundary was located to exclude steep, unstable area.

Wildlife

Concern:	Red-tailed hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 2 acres of good value marten habitat in the northern end.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate one (1) reserve tree clump (approximately 0.5 to 1.0 acre) on the upper slopes of unit to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	The originally planned cumulative size harvested opening (in conjunction with Unit 96) was 53 acres.
Mitigation:	Unit was redesigned from 24 to 11 acres to reduce the cumulative size of Units 96 and 97 to 23 acres. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

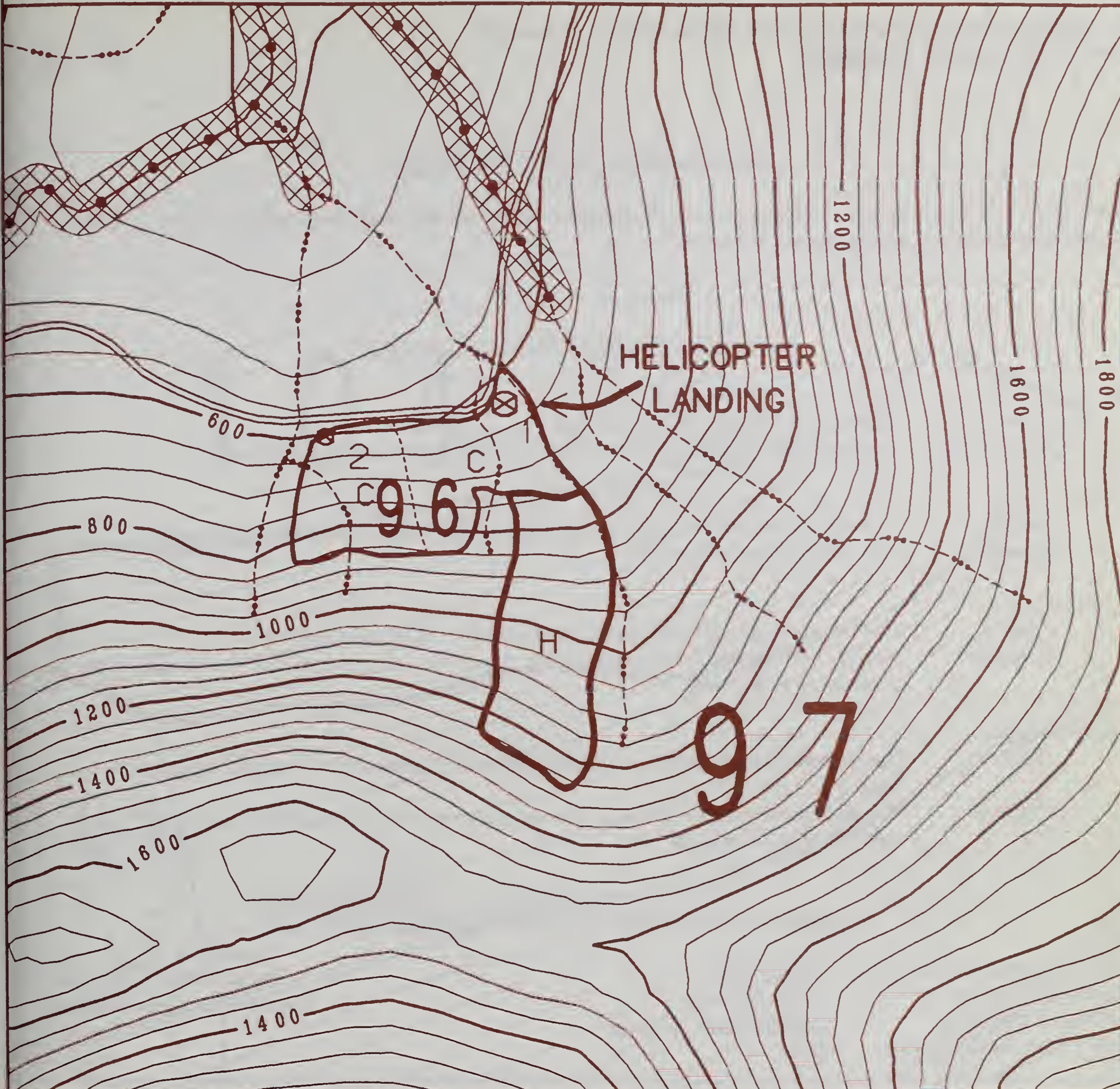
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 2 in Unit 96.

AREA: S. LINDENBERG UNIT:97 ACRES:11 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 35 PHOTO#: 176-33

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 104 Acres: 73 **ALT: 3,5**
Net Sawlog Volume: 368 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

North (upper) boundary follows non-commercial forest. South boundary follows a slope break and upper limit for cable yarding deferred areas north of proposed Road 43520.

RESOURCE CONCERNS AND MITIGATIONS

Soils

Concern:	Slopes exceed 75 percent in some areas.
Mitigation:	Group selection acres will not be implemented on slopes exceeding 70 percent.

Wildlife

Concern:	Unit has 15 acres of average value Sitka black-tailed deer habitat in the southern end.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure in harvested openings.
Mitigation:	Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit is seen in middleground from Wrangell Narrows. Unit originally planned as a clearcut.
Mitigation:	Unit redesigned as group selection. Harvest approximately 11 acres in small groups (1.5 to 2.5 acres) distributed across the unit.

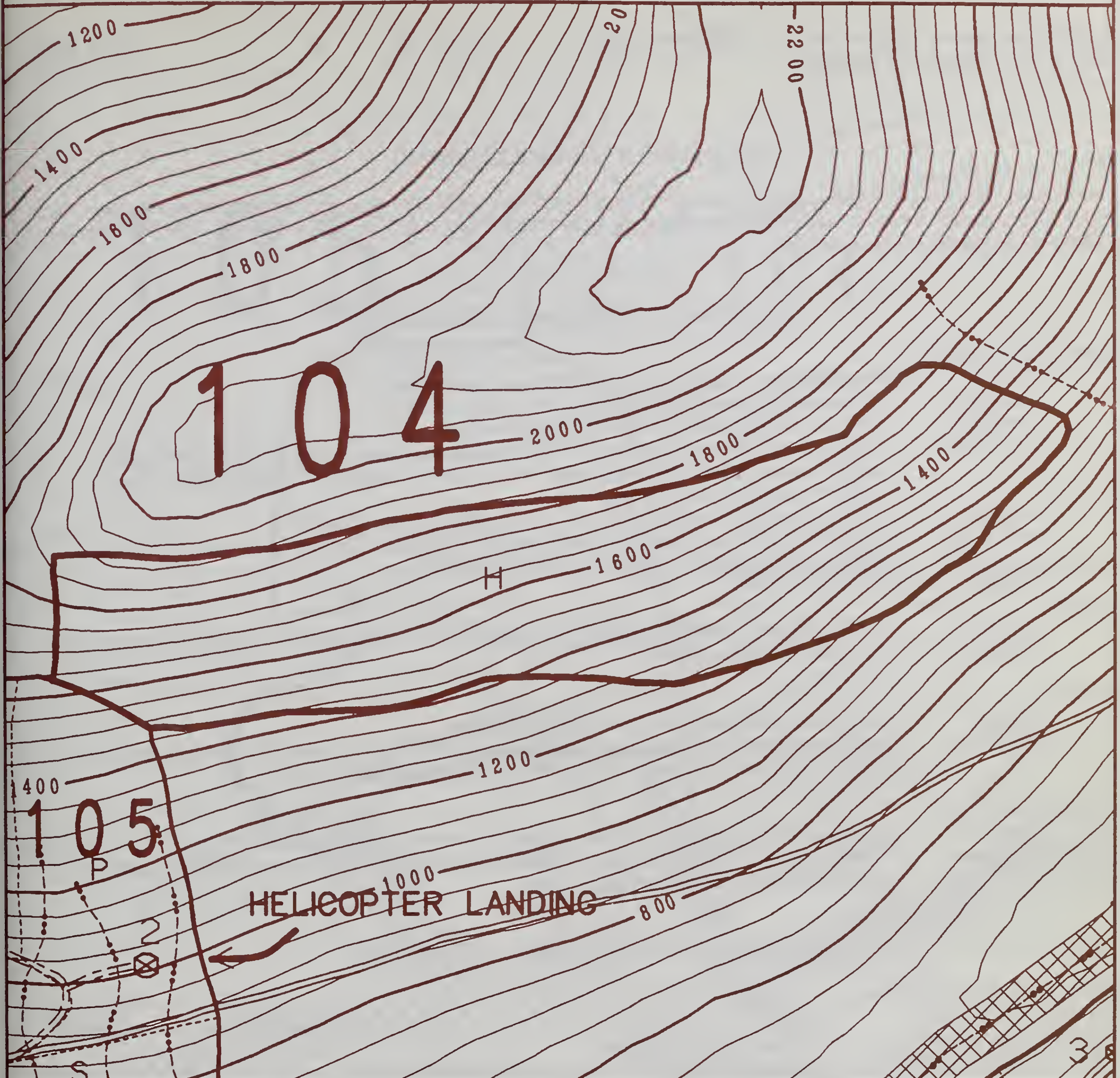
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Uneven Aged	Rotation Period: 180 years
Silvicultural Prescription:	Group Selection	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	None	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 2 in Unit 105 at end of proposed spur road.

AREA: S. LINDENBERG UNIT:104 ACRES:73 VCU: 447



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg Silviculturist	3/10/95 Date
Reviewed By:	Jeff Barrett I.D. Team Leader	3/10/95 Date

FLIGHT LINE: 37 PHOTO#: 176-198

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 105 **Acres: 65** **ALT: 2,3,5**
Net Sawlog Volume: 1,840 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

North (upper) boundary is follows a logical slope break to maintain logging feasibility. East boundary follows commercial timber setting break. South boundary follows muskeg/non-commercial forest and Class II TTRA buffer. The west boundary follows muskeg/non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located close to southwest corner of unit.
Mitigation:	Unit boundary is located to exclude 100-ft. TTRA buffer.
Concern:	Several Class III streams are located within the unit.
Mitigation:	Require partial log suspension over Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.
Concern:	Proposed temporary spur road would cross numerous Class III streams.
Mitigation:	Minimize the erosion of effects of concentrated water flow. Riprap culvert inlets and outlets. Avoid channel width changes and protect embankments.

Wildlife

Concern:	Unit has 28 acres of average value Sitka black-tailed deer habitat in the northern and eastern ends.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two (2) groups of reserve trees (approximately 0.5 to 1.0 acres) along setting break to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper part of boundary is seen in middleground from Wrangell Narrows.
Mitigation:	Feather upper (north) unit boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

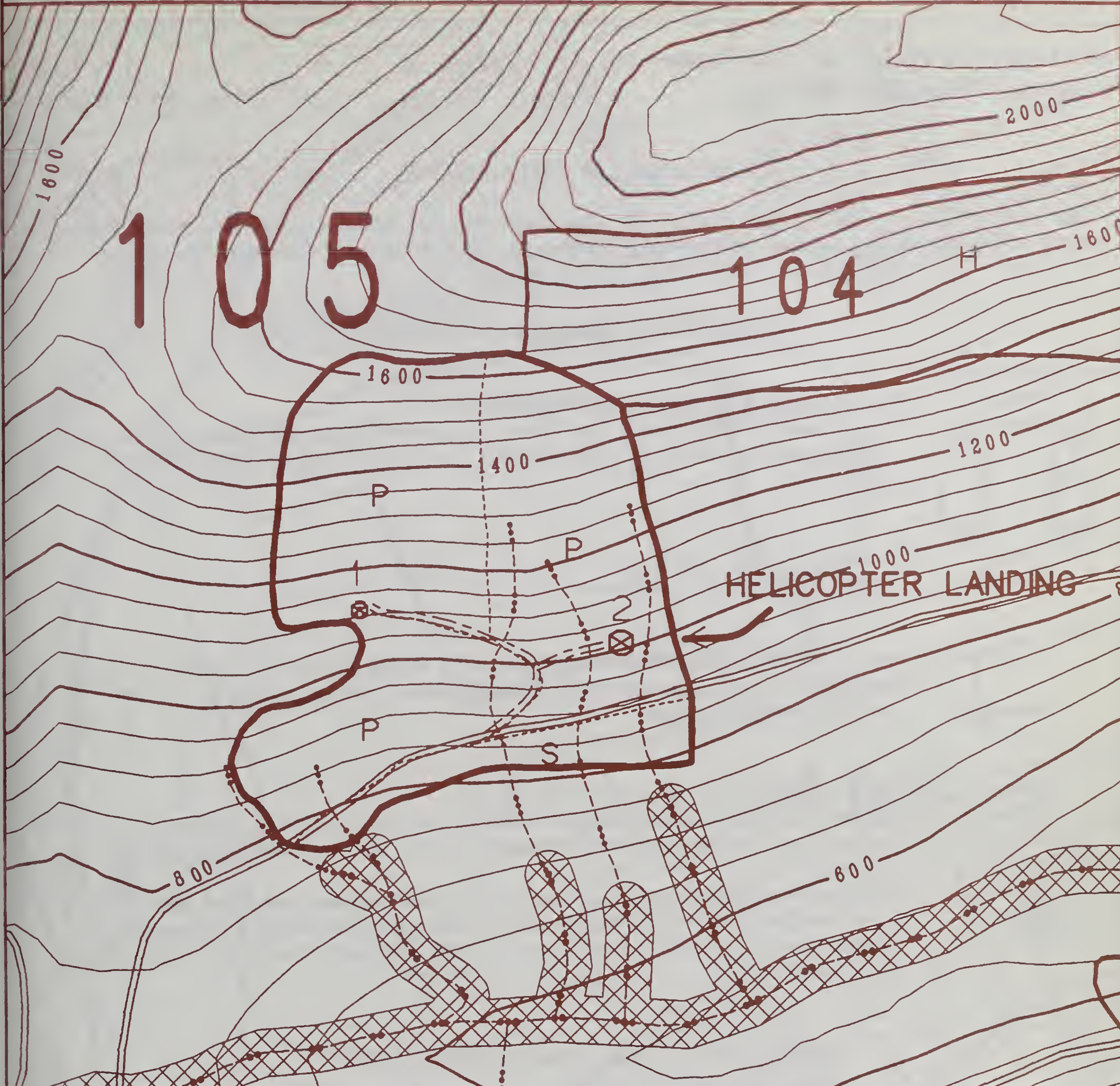
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	100 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	Alaska-cedar decline in unit; do not plant Alaska-cedar.		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a combination of slackline, mobile yarder and shovel yarding. A slackline yarder is needed to yard the upper slopes. A temporary road (approximately 0.4 miles) would be constructed to access landings. Stream crossings required include: MP 0.0 - 48 inch pipe, MP 0.1 - 48 inch pipe. A mobile yarder is recommended for the area between the temporary road and Road 43520 in southwest corner. Shovel logging is recommended below Road 43520 in south portion of unit. Landing 2 would be used for helicopter yarding Unit 104 and covers approximately one acre.

AREA: S. LINDENBERG UNIT:105 ACRES:65 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-198

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 106 **Acres: 51** **ALT: 2,3,5**
Net Sawlog Volume: 1,751 MBF **VCU: 437/447**

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follows a Class III stream channel. The upper (south) boundary follows a logical slope break to make it possible to achieve partial log suspension. The north and west boundary follow muskeg and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Class III stream is located along east boundary.

Mitigation: Require directional falling away from stream. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern: V-notch on east end of unit.

Mitigation: Careful practices may be required.

Wildlife

Concern: Unit has 14 acres of good value marten habitat in the northeastern end and 21 acres of average value Sitka black-tailed deer habitat in the northern end and through the middle.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate one (1) reserve tree clump (approximately 0.5 to 1.0 acre) at setting break between Landings 1 and 2 to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: Southern portion of unit (top of slope) may be seen in middleground from Wrangell Narrows.

Mitigation: Unit boundary was relocated 200 feet down slope and unit size was reduced. Feather south boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years

Silvicultural Prescription: Clearcut — Regeneration Method: Natural

Anticipated Treatments: Precommercial Thinning

Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to one landing and slackline yarding to a second landing along proposed Road 43521. Slackline yarder is recommended to achieve yarding distance and partial log suspension.

AREA: S. LINDENBERG UNIT:106 ACRES:51 VCU: 447/437

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg	6/06/95
	Silviculturist	Date
Reviewed By:	Ron Bockelman	6/06/95
	I.D. Team Leader	Date

FLIGHT LINE: 37 PHOTO#: 176-197

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 107 **Acres: 49** **ALT: 2,5**
Net Sawlog Volume: 1,516 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows muskeg/non-commercial forest. The upper boundary (south and east) follow a slope break. The west boundary follows a setting break.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

- Concern: Class III stream bisects the middle setting.
- Mitigation: Require directional falling away from Class III stream. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

- Concern: Red-tailed hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
- Mitigation: Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
- Concern: Unit has 36 acres of good value marten habitat, and 9 acres of average value Sitka black-tailed deer habitat in the northeastern end.
- Mitigation: this concern is not mitigated.

Biodiversity

- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Locate two reserve tree clumps (approximately 0.5 to 1.0 acres) at setting breaks to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

- Concern: Upper portion of unit may be seen in the middleground from Wrangell Narrows, and most of unit may be seen in the distant middleground from Ravens Roost Cabin.
- Mitigation: Feather upper boundary to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

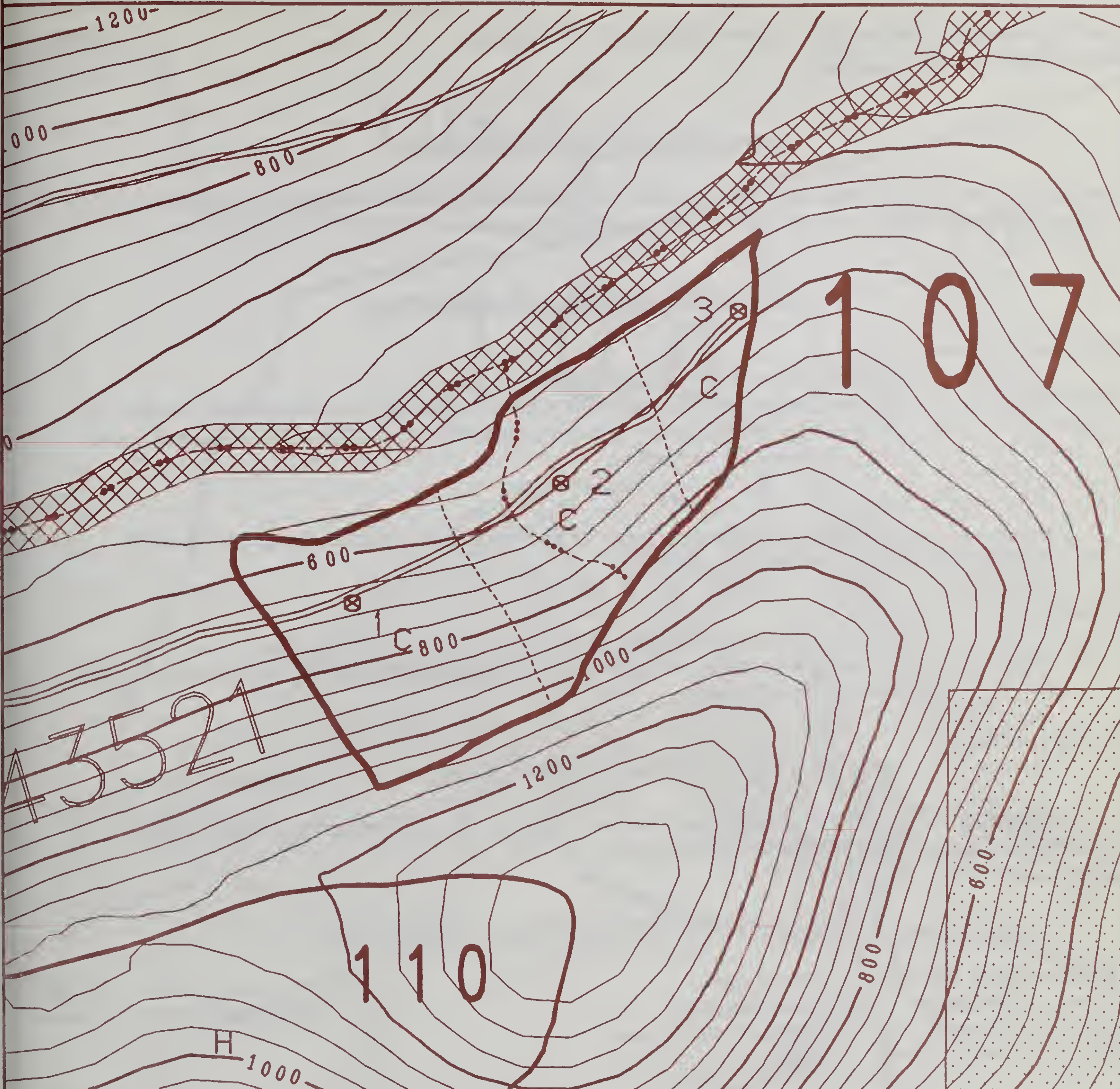
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to three landings on proposed Road 43521.

AREA: S. LINDENBERG UNIT:107 ACRES:49 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-197

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 108 Acres: 74 **ALT: 3,5**
Net Sawlog Volume: 222 MBF **VCU: 437/447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a ridge top and slope break. The east boundary follows a saddle and west boundary of Unit 110. The south boundary follows a managed stand and the upper (north) boundary of Unit 109.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

- Concern: Class III streams are located in southeast corner of unit.
- Mitigation: Require directional falling away from Class III stream. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

- Concern: Unit has 2 acres of average value Sitka black-tailed deer habitat in the northwestern end.
- Mitigation: This concern is not mitigated.

Biodiversity:

- Concern: Harvest would eliminate old growth stand structure in harvested openings.
- Mitigation: Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources

- Concern: Harvest area is seen in middleground from Wrangell Narrows. Unit originally planned as a clearcut.
- Mitigation: Unit redesigned as group selection. Harvest 11 acres in small groups (1.5 and 2.5 acres) distributed across the harvest unit.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

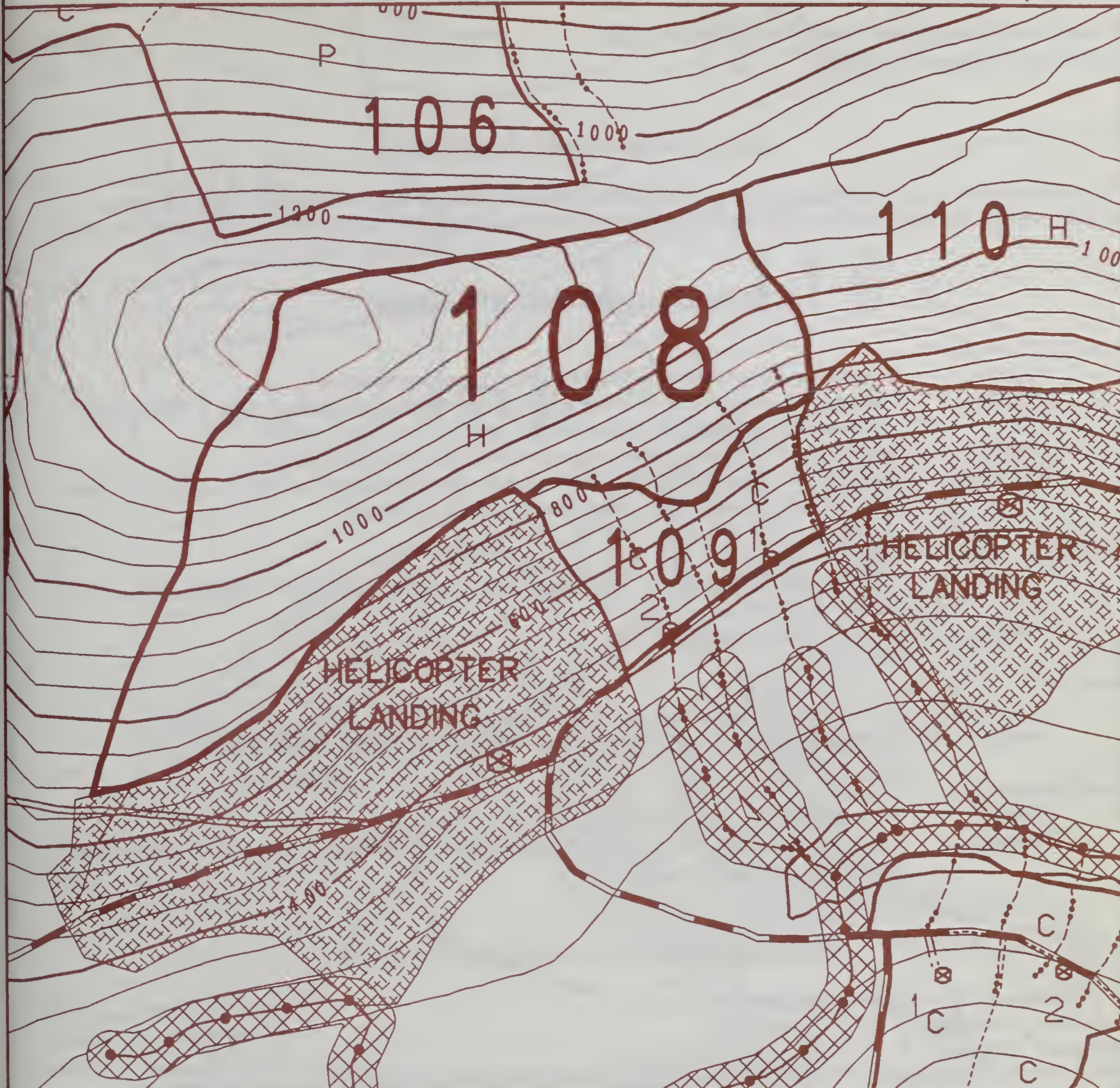
Stand Management Objectives: Uneven Aged
Silvicultural Prescription: Group Selection
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 180 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to a proposed landing within managed stand south of unit. Locate harvest groups to minimize potential windthrow.

AREA: S. LINDENBERG UNIT:108 ACRES:74 VCU: 447/437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-197

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 109 Acres: 14 ALT: 2
Net Sawlog Volume: 190 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The north boundary was lowered in response to visual quality concerns. The east and west boundaries follow existing managed stands. The south boundary follows Road 6350 in response to numerous Class II streams located below the road

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Several Class II streams were located within originally planned unit.

Mitigation: The area affected by Class II streams was excluded from unit to maintain 100-ft. TTRA buffer. Unit boundary is located along Road 6350 to form logical unit boundary.

Concern: Several Class III streams drain in Class II streams south of unit boundary.

Mitigation: Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern: Unit has 1 acre of good value marten habitat and 1 acre of average value Sitka black-tailed deer habitat.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Feathering boundaries would provide some structural diversity in harvested unit.

Visual Resources

Concern: Harvested opening is seen in middleground from Wrangell Narrows.

Mitigation: Unit redesigned from 37 to 14 acres. Upper boundary is undulated. Feather east, north, and west boundaries to reduce angular edge.

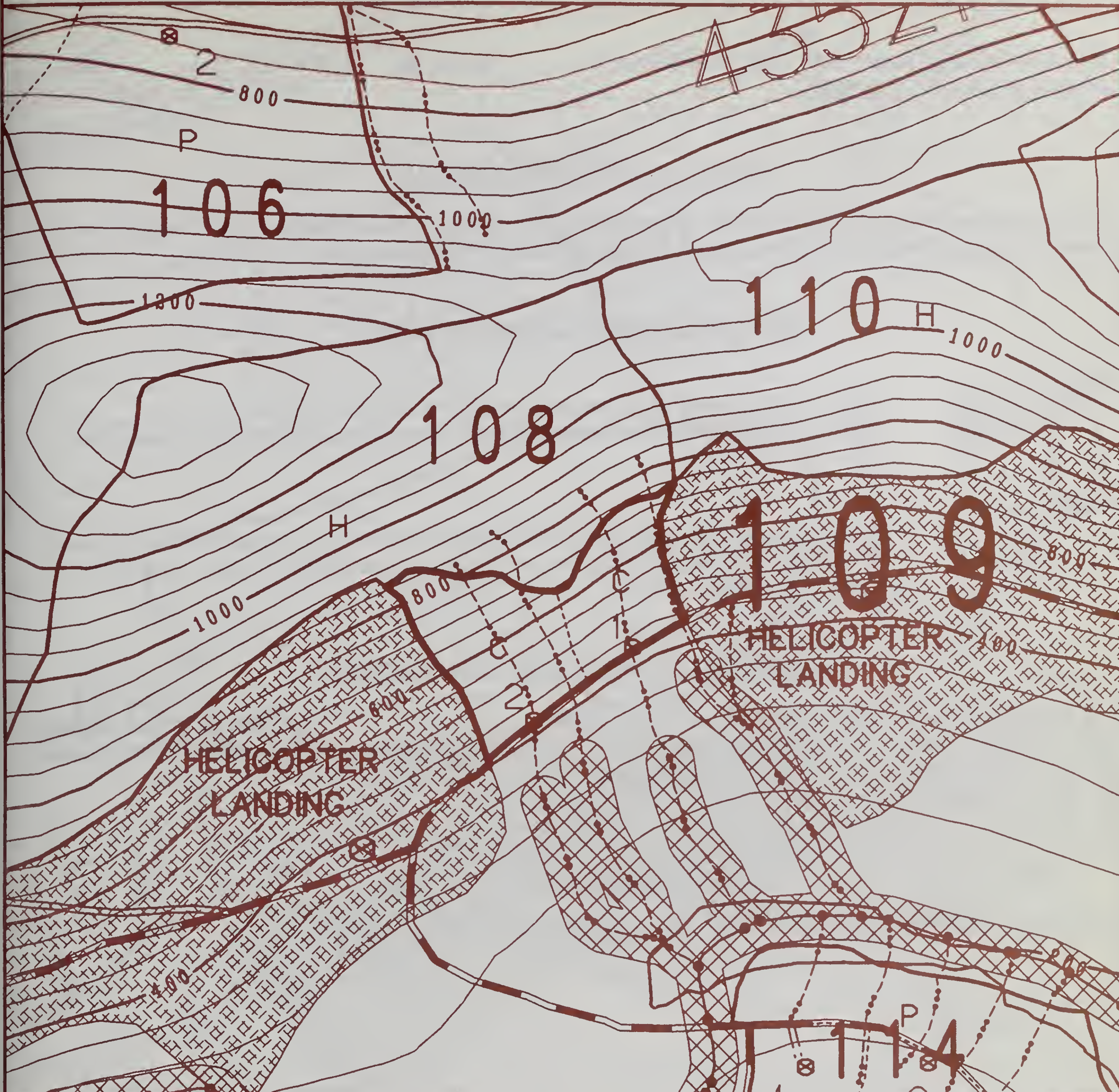
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 120 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings along existing Road 6350.

AREA: S. LINDENBERG UNIT:109 ACRES:14 VCU:447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-197

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 110 Acres: 64 ALT: 3
Net Sawlog Volume: 129 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a ridgetop. The west boundary follows a common boundary with Unit 108. The south boundary follows an existing managed stand. The southeast boundary excludes over steepened slopes.

RESOURCE CONCERNS AND MITIGATIONS

Biodiversity

Concern: Harvest would eliminate old growth stand structure in harvested openings.

Mitigation: Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: Harvest unit is seen in middleground from Wrangell Narrows. Unit originally planned as clearcut.

Mitigation: Unit redesigned as group selection. Harvest 10 acres in small groups (1.5 and 2.5 acres) distributed across the harvest unit.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

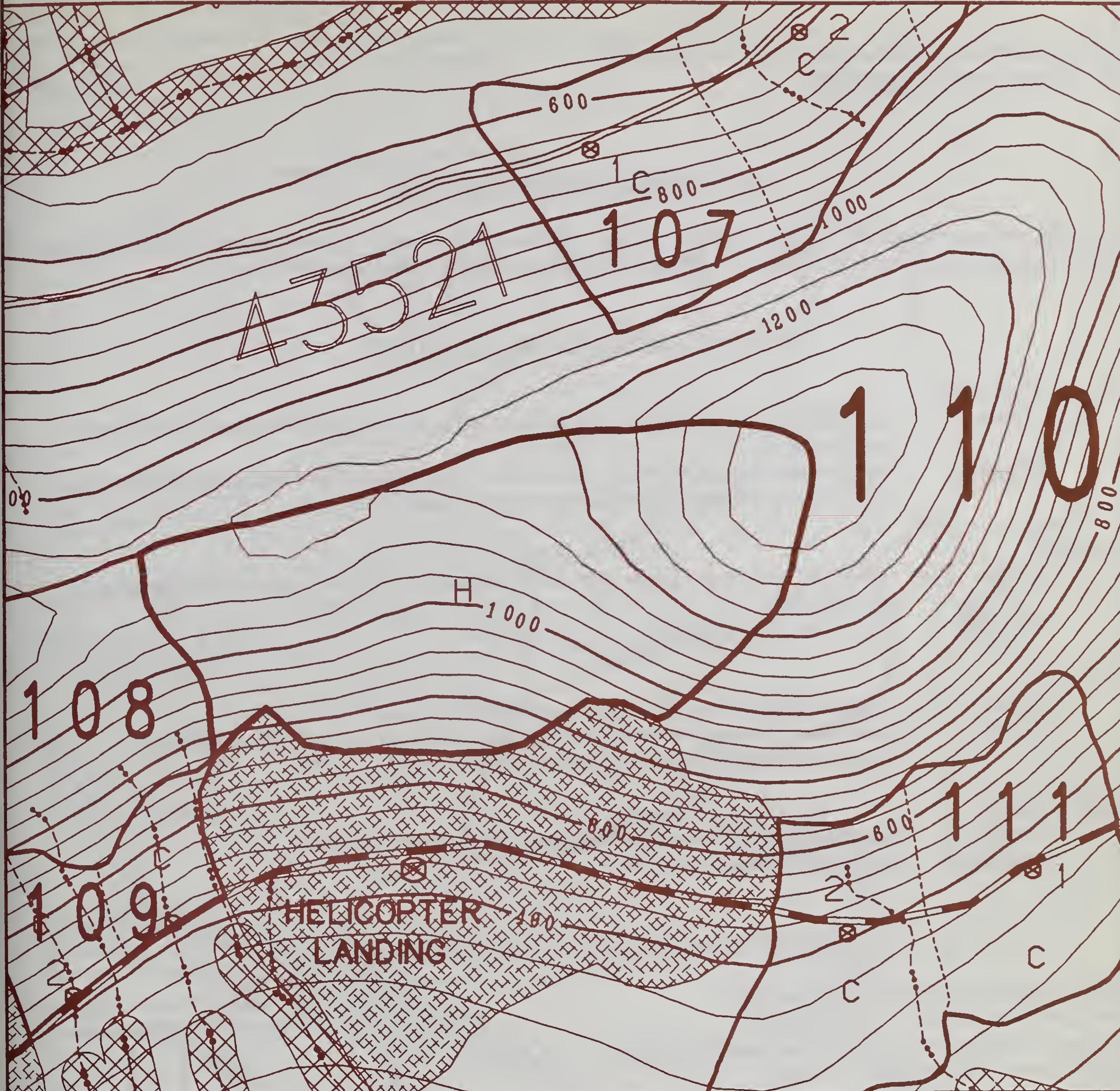
Stand Management Objectives: Uneven Aged
Silvicultural Prescription: Group Selection
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 180 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to a landing on existing Road 6350 south of Unit 10.

AREA: S. LINDENBERG UNIT: 110 ACRES: 64 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-197

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 111 **Acres: 44** **ALT: 5**
Net Sawlog Volume: 1,009 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary excludes steep slopes. The east boundary follows a setting break. The west boundary follows managed stand, muskeg, and non-commercial forest. South boundary follows muskeg and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Class III stream channel in west setting drains into a Class II stream immediately downstream of unit boundary.

Mitigation: Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern: Unit has 37 acres of good value marten habitat and 37 acres of average value Sitka black-tailed deer habitat.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate two (2) reserve tree clumps along setting break north of Road 6350 to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: Unit may be seen in the near middleground from Wrangell Narrows.

Mitigation: Partial cut visible portion of unit.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 120 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings along existing Road 6350.

AREA: S. LINDENBERG UNIT:111 ACRES:44 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-197

South Lindenberg Timber Sale Unit Number: 114 Acres: 31 ALT: 4
Net Sawlog Volume: 639 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows existing road and TTRA Buffer. The north boundary follows the top of bench outside the inner gorge of Class 1 stream, excluding the 100-ft. TTRA buffer and stream floodplain. The east boundary follows the edge of a managed stand and continues to top of ridge. The southwest boundary follows the top of ridge and existing managed stand.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class 1 stream is located close to west and north portions of unit.
Mitigation:	Unit boundary was located to exclude 100- ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	A series of Class III V-notches drain directly into Class I stream located north of unit.
Mitigation:	Require directional falling of trees away from Class III channels. Split-yard stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris shall be left undisturbed.

Wildlife

Concern:	Unit has 9 acres of good value marten habitat and 8 acres of average value Sitka black-tailed deer habitat in the southern end.
Mitigation:	This concern is not mitigated.
Concern:	Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate one reserve tree clump (approximately 0.5 to 1.0 acres) to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper slopes of unit are seen in middleground from Wrangell Narrows; harvesting southeast corner of unit would expose rock bluffs.
Mitigation:	Leave a strip of uncut timber to screen rock face and feather leave strip into unit. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	100 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Recommend a combination of mobile yarder and high-lead yarder to harvest unit. Two landings tributary to existing Road 69355 would be used. Mobile yarder would yard timber below (north of) road to existing roadway.

AREA: S. LINDENBERG UNIT:114 ACRES:31 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-196

South Lindenberg Timber Sale **Unit Number: 114M** **Acres: 13** **ALT: 2**
Net Sawlog Volume: 310 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The southwest boundary follows existing Road 6355. The north boundary follows the top of bench outside the inner gorge of Class 1 stream, excluding the 100-ft. TTRA buffer and stream floodplain. The east boundary follows the edge of a managed stand to Road 6355.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class 1 stream is located in close proximity to west and north portions of unit.
Mitigation:	Unit boundary is located to exclude 100-ft. TTRA, plus additional area to reduce sedimentation into the stream channel.
Concern:	A series of Class III V-notches drain directly into Class I stream located to north of unit.
Mitigation:	Require directional falling of trees away from Class III channels. Split-yard stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Unit has 9 acres of good value marten habitat and 8 acres of average value Sitka black-tailed deer habitat in the southern end.
Mitigation:	This concern is not mitigated.
Concern:	Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Upper slopes of unit are seen in middleground from Wrangell Narrows; harvesting southeast corner of unit would expose rock bluffs.
Mitigation:	Leave a strip of uncut timber to screen rock face and feather leave strip into unit. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

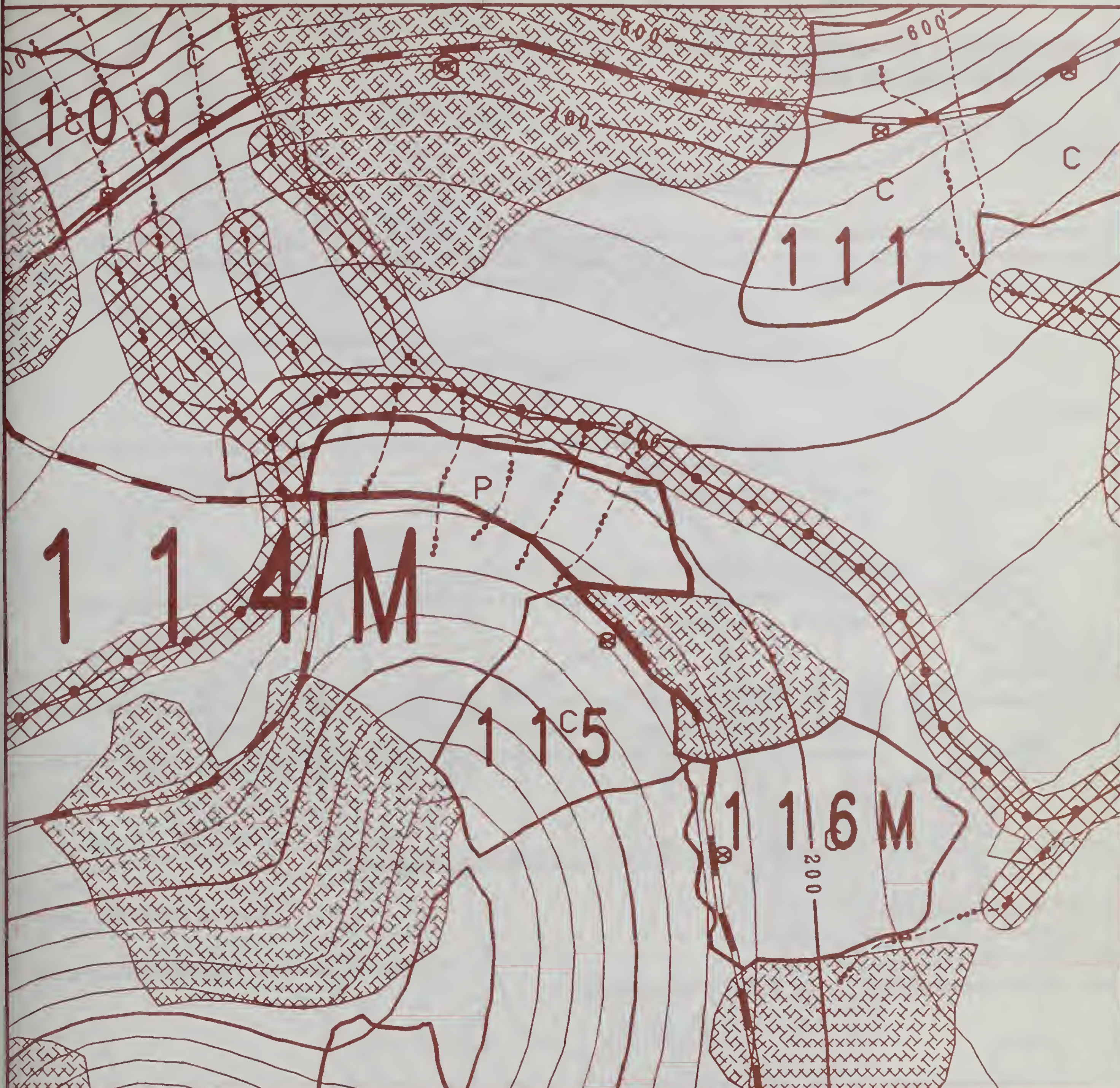
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	100 years
Silvicultural Prescription:	Clearcut	Regeneration Method:	Natural
Anticipated Treatments:	Precommercial Thinning		
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a mobile yarder to yard to the existing Road 6355.

AREA: S. LINDENBERG UNIT:114M ACRES:13 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-196

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 115 Acres: 16 **ALT: 4**
Net Sawlog Volume: 257 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The northwest boundary follows a logical setting break and is common with east boundary of Unit 114. The northeast boundary follows existing road and west edge of managed stand. The south boundary follows a logical setting break. The west boundary follows top of ridge.

RESOURCE CONCERNS AND MITIGATIONS

Wildlife

Concern:	Unit has 6 acres of good value marten habitat in the southern end, and 11 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in middleground from Wrangell Narrows; harvesting southeast corner of unit could expose rock bluffs along upper unit boundary.
Mitigation:	Leave strip of uncut timber to screen rock face and feather leave strip into unit to reduce angular edge.

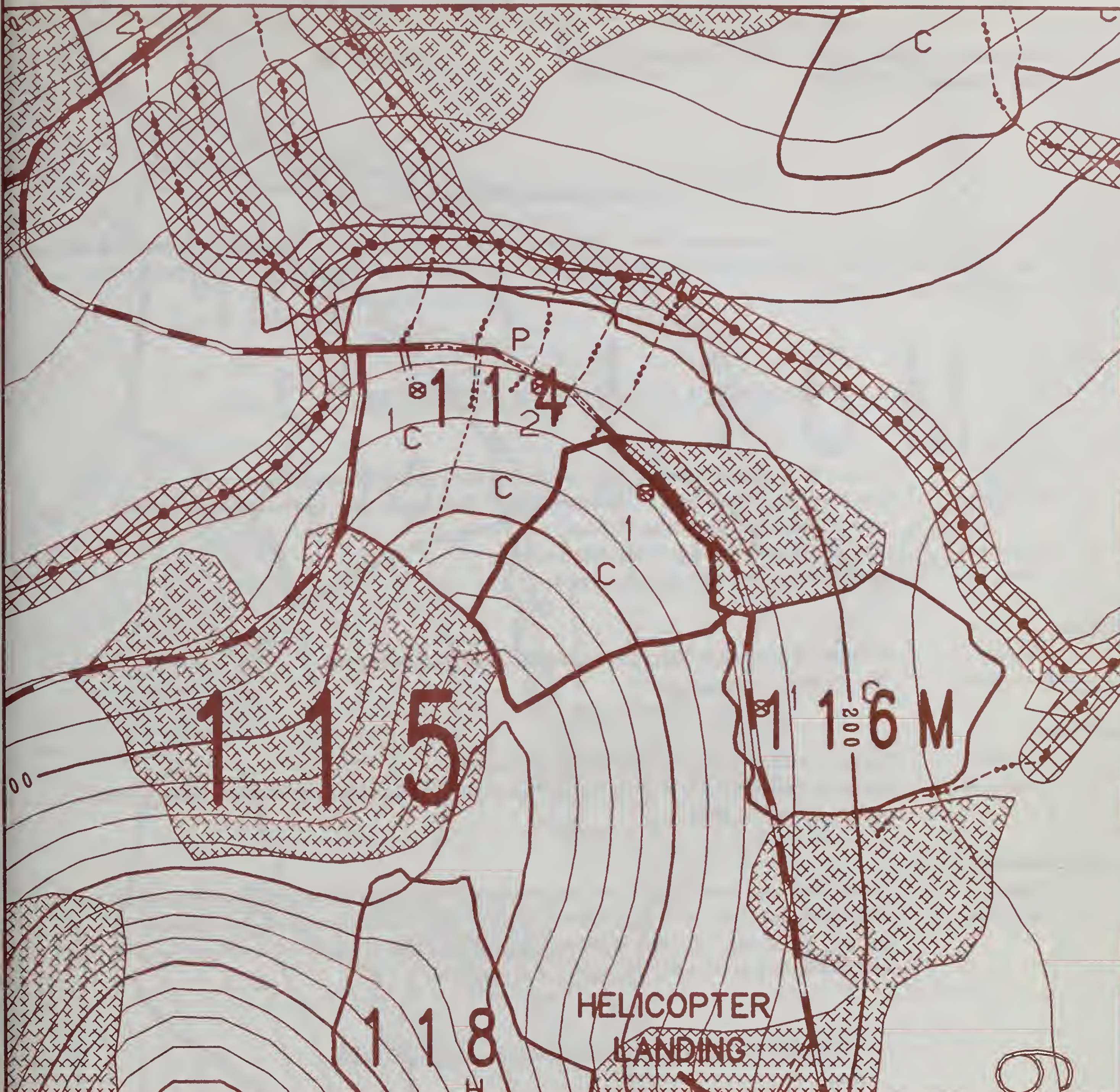
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to one landing along existing Road 6355.

AREA: S. LINDENBERG UNIT:115 ACRES:16 VCU: 447



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)

N

- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg (Silviculturist)	6/06/95 (Date)
Reviewed By:	Ron Bockelman (I.D. Team Leader)	6/06/95 (Date)

FLIGHT LINE: 37 PHOTO#: 176-196

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale **Unit Number: 116M** **Acres: 20** **ALT: 2**
Net Sawlog Volume: 260 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows the edge of a managed stand. The east boundary is located along floodplain edge and logical setting break. The south boundary follows scrub timber and edge of managed stand to Road 6355. West boundary follows a ragged line above (west) Road 6355.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II and I streams are located in close proximity to east portion of unit.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams forms part of south boundary.
Mitigation:	Require directional falling from stream.

Wildlife

Concern:	Unit has 20 acres of average value Sitka black-tailed deer habitat.
Mitigation;	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit seen in middleground from Wrangell Narrows. Adjoins previously harvested area.
Mitigation:	Unit redesigned from 32 to 20 acres by excluding visible portion of unit west of Road 6355. Leave a ragged edge of timber approximately 100 to 200 feet above (west of) road 6355 at the west unit boundary to reduce straight-line appearance.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for slackline yarding to one landing along existing Road 6355. Slackline yarder is recommended to achieve yarding distance and provide log lift.

AREA: S. LINDENBERG UNIT:116M ACRES:20 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg	6/06/95
	Silviculturist	Date
Reviewed By:	Ron Bockelman	6/06/95
	I.D. Team Leader	Date

FLIGHT LINE: 37 PHOTO#: 176-196

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 118 Acres: 24 ALT: 5
Net Sawlog Volume: 84 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follow a logical setting break and edge of managed stand. The west boundaries follow slope breaks and non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Wildlife

Concern:	Unit has 20 acres of good value marten habitat and 22 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure in harvested openings.
Mitigation:	Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is located on upper slopes and is seen in middleground from Wrangell Narrows.
Mitigation:	Harvest 4 acres in small groups (1.5 to 2.5 acres) distributed across the unit.

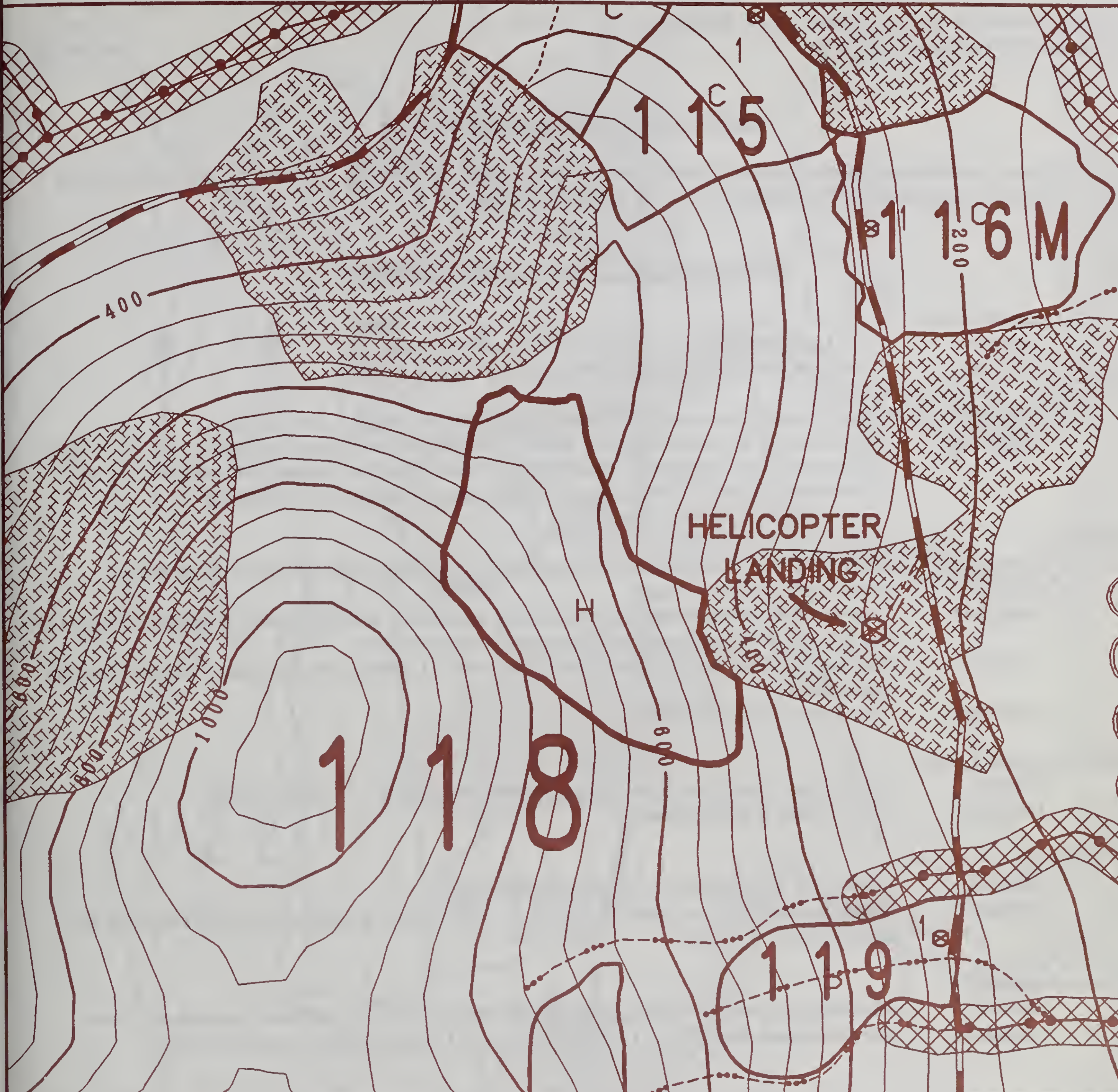
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Uneven Aged — Rotation Period: 180 years
Silvicultural Prescription: Group Selection
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter landing to existing landing located in managed stand north of proposed Unit 119.

AREA: S. LINDENBERG UNIT:118 ACRES:24 VCU: 447



- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)

N

- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-196

LOGGING METHOD CODES: C = CABLE S = SHOVEL
H = HELICOPTER
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 119 Acres: 11 **ALT: 2**
Net Sawlog Volume: 284 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north and south boundaries close follow Class I, II and III stream channels. The east boundary follows existing Road 6355. The top of unit (west end) is rounded in response to visual concerns.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I and II streams are located close to east end of unit.
Mitigation:	Unit boundaries were located to exclude 100-ft. TTRA buffer.
Concern:	Class III stream is located within unit and flows directly into a Class I stream.
Mitigation:	Require partial log suspension over stream channel. Require directional falling away from Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 11 acres of good value marten habitat and 11 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit is seen in middleground from Wrangell Narrows. Originally planned as 30 acres.
Mitigation:	Unit redesigned from 30 to 11 acres. The west end of unit boundary located to taper.

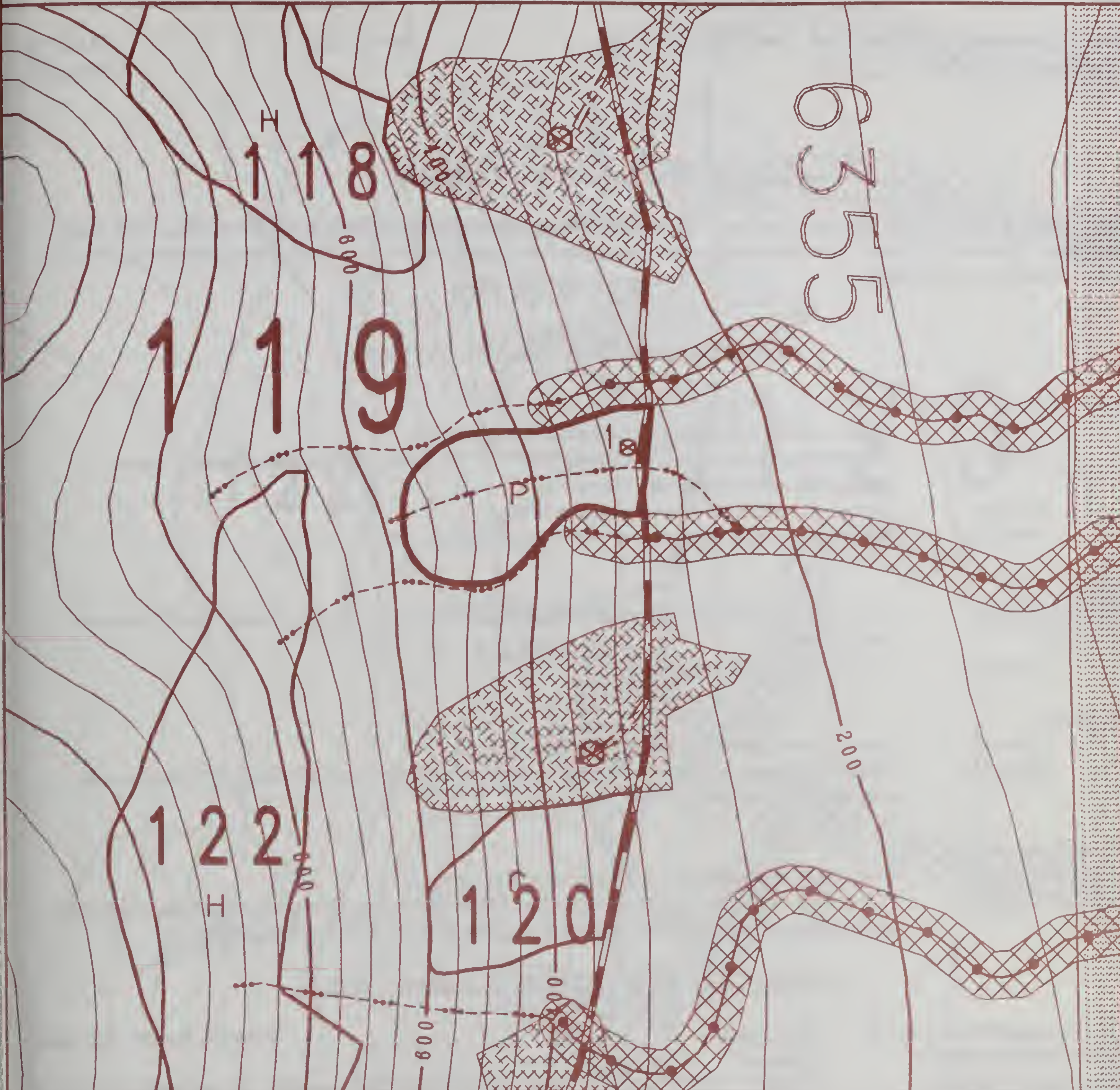
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 110 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Interplant western redcedar to promote species diversity.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a slackline yarder to achieve partial log suspension and/or split yarding of Class III stream. Landing would be located along existing Road 6355.

AREA: S. LINDENBERG UNIT:119 ACRES:11 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 120 Acres: 10 ALT: 2
Net Sawlog Volume: 370 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows edge of managed stand and tapers at the top of unit in response to visual concerns. The south boundary leaves area of uncut timber between unit and managed stand in response to visual and fisheries concerns. Road 6355 forms the east boundary.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class II stream is located near southeast portion of unit.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	A Class III stream parallels the south boundary.
Mitigation:	Require directional falling away from stream channel.

Wildlife

Concern:	Unit has 8 acres of good value marten habitat and 10 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Unit is seen in middleground from Wrangell Narrows.
Mitigation:	Unit redesigned from 23 to 10 acres and top of unit tapered to leave uncut area between unit and managed stand. Feather north, west and south boundaries to reduce angular edge.

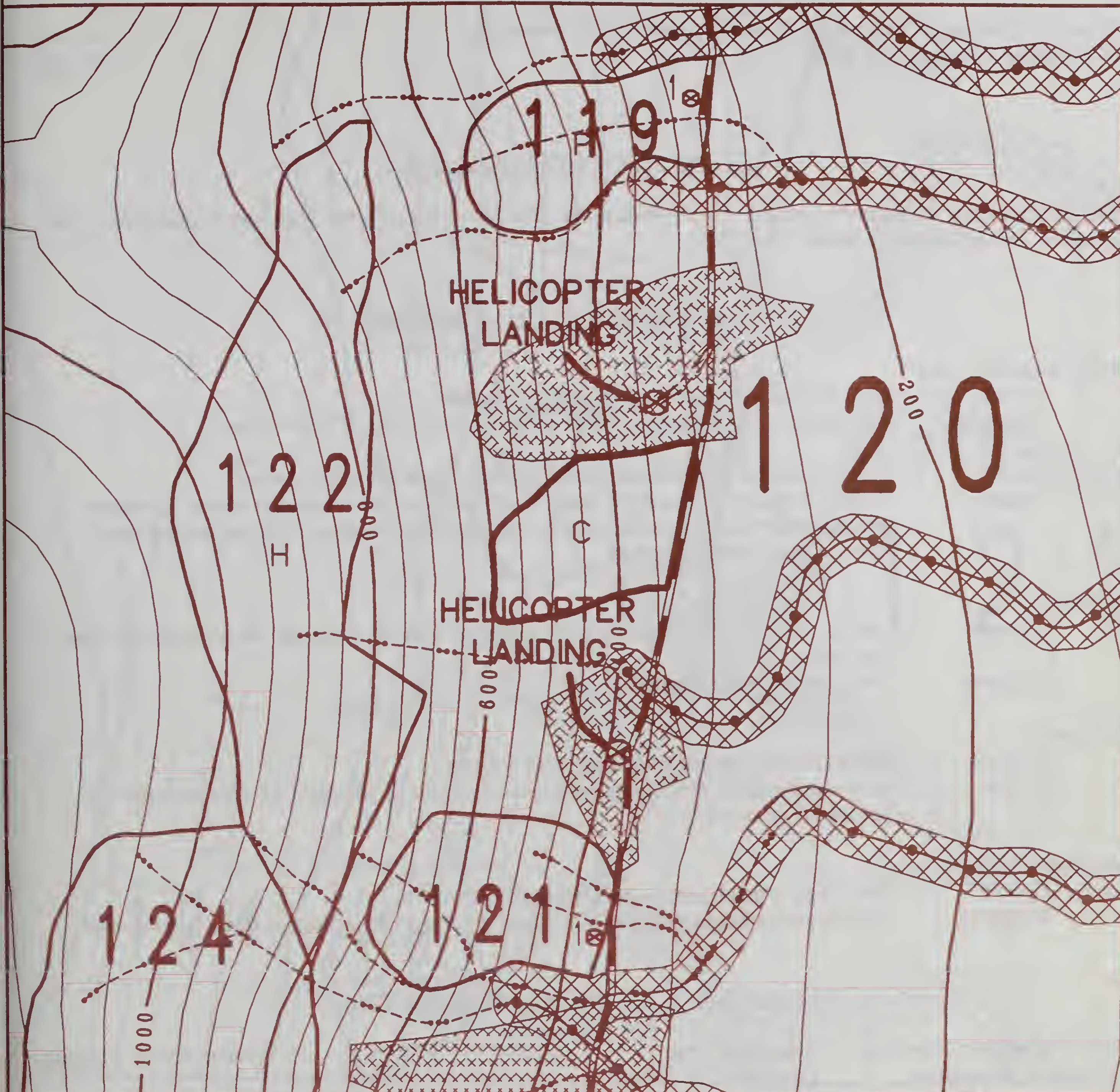
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	110 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for yarding by mobile yarder to existing Road 6355.

AREA: S. LINDENBERG UNIT:120 ACRES:10 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

LOGGING METHOD CODES: C = CABLE S = SHOVEL
H = HELICOPTER
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

South Lindenberg Timber Sale Unit Number: 121 Acres: 14 **ALT: 2**
Net Sawlog Volume: 338 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The south boundary was located to exclude 100-ft. TTRA buffer. The boundaries on upper slope taper in response to visual concerns. The east boundary follows Road 6355.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Class II stream is located close to south portion of unit.
Mitigation: Unit boundary was located to exclude Class II TTRA buffer.

Concern: Three Class III streams dissect unit and ultimately drain into Class I stream.
Mitigation: Require directional falling away from Class III channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern: Unit has 14 acres of good value marten habitat and 14 acres of average value Sitka black-tailed deer habitat.
Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.
Mitigation: Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: Unit is seen in middleground from Wrangell Narrows.
Mitigation: Unit size was redesigned from 22 to 14 acres. Feather west boundary to reduce angular edge.

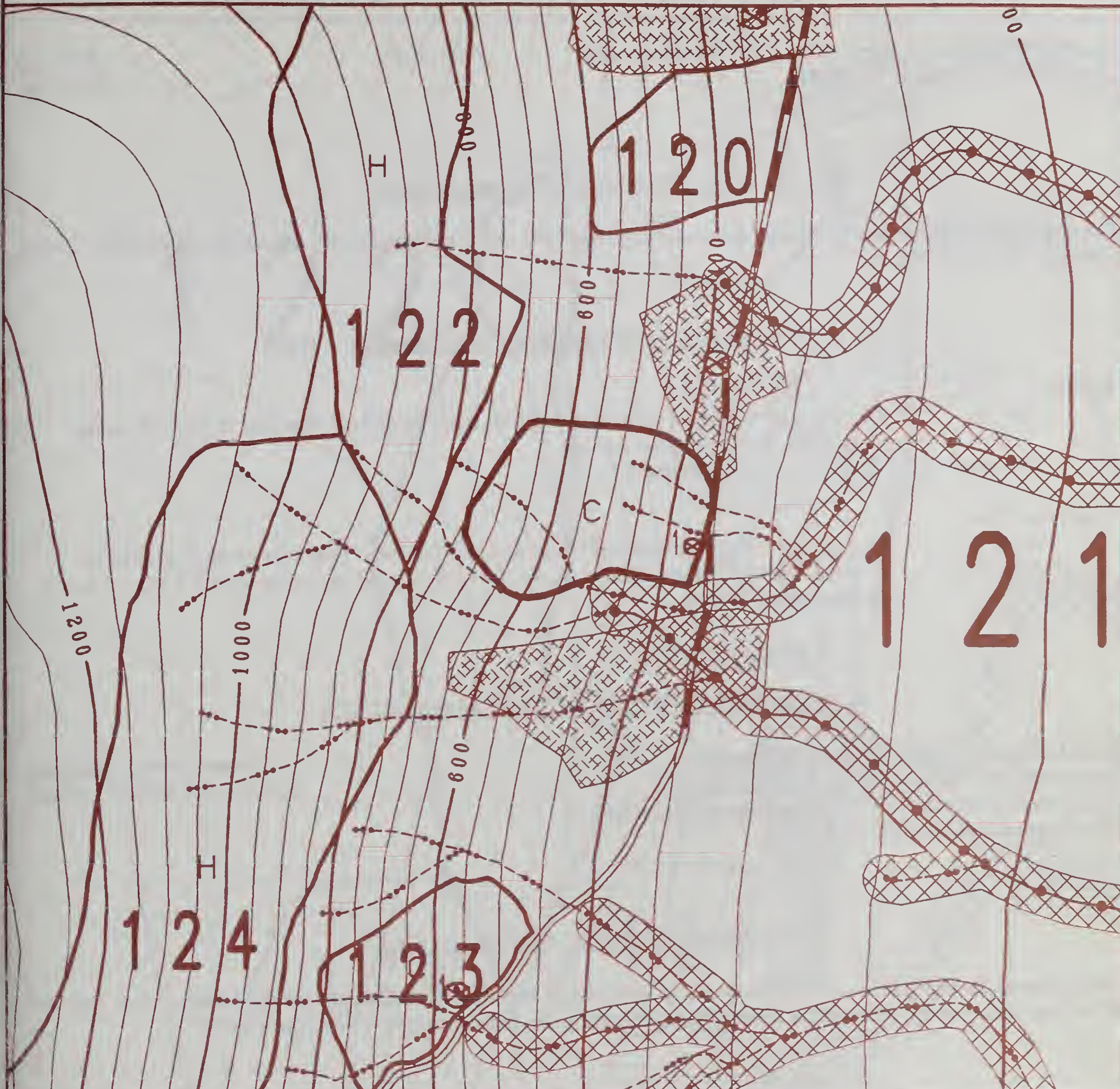
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 110 years
Silvicultural Prescription: Clearcut
Regeneration Method: Natural — Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Interplant western redcedar to promote species diversity.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to one landing along existing Road 6355.

AREA: S. LINDENBERG UNIT:121 ACRES:14 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 122 Acres: 44 ALT: 3,5
Net Sawlog Volume: 206 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

Upper boundary follows non-commercial forest and ridge line. The east boundary basically follows the upper limit of cable yarding from Road 6355.

RESOURCE CONCERNS AND MITIGATIONS

Wildlife

Concern: Unit has 9 acres of good value marten habitat along the eastern edge, and 30 acres of average value Sitka black-tailed deer habitat.

Mitigation: This concern is not mitigated.

Visual Resources

Concern: Harvest unit seen in middleground from Wrangell Narrows. Originally planned as clearcut.

Mitigation: Unit redesigned as group selection. Harvest 7 acres in small groups (between 1.5 and 2.5 acres) distributed across unit.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

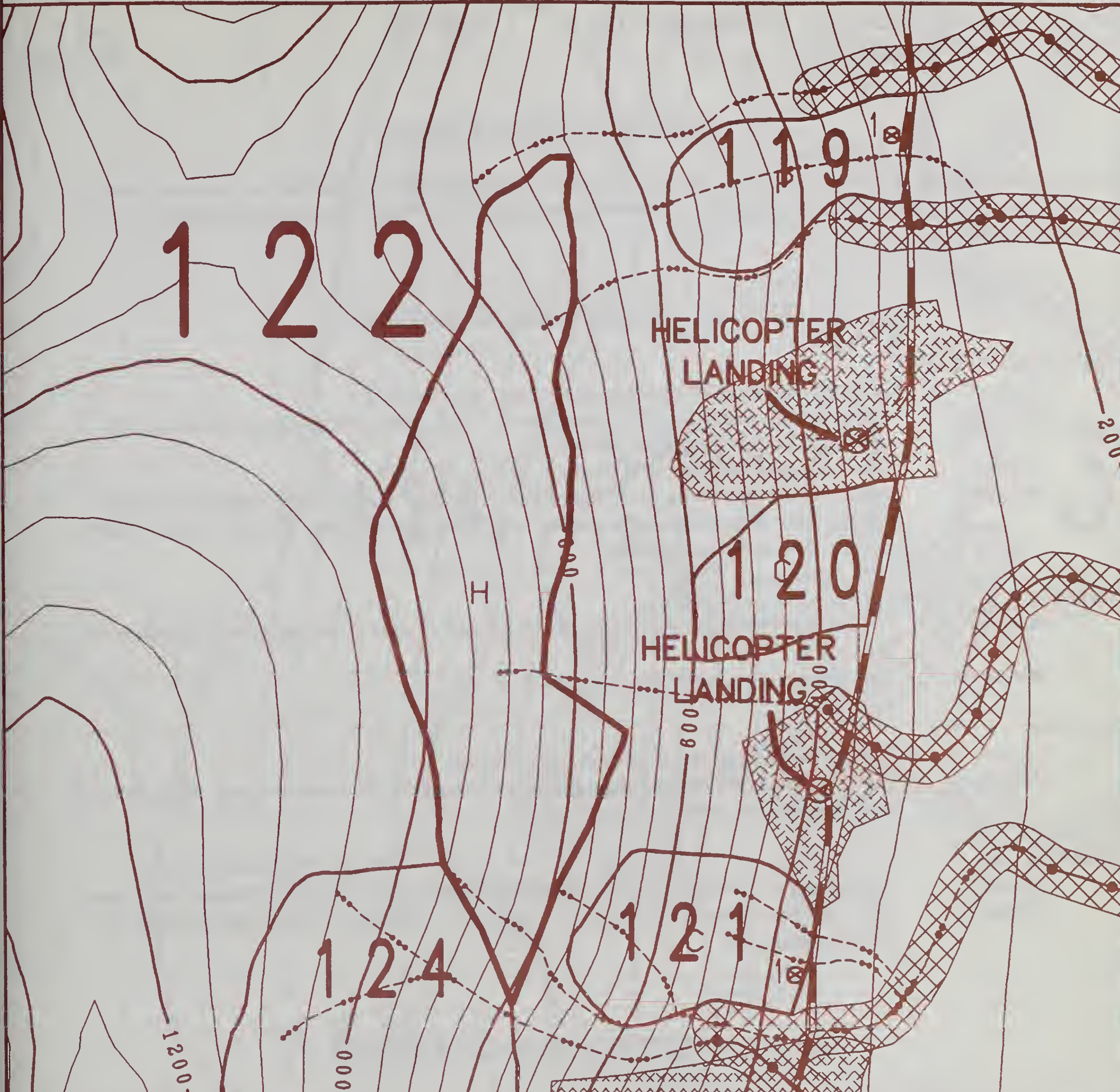
Stand Management Objectives: Uneven Aged
Silvicultural Prescription: Group Selection
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 180 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to two landings; one landing would be located along Road 6355 south of Unit 120 and the second landing would be located at the end of the temporary spur in the managed stand north of Unit 120.

AREA: S. LINDENBERG UNIT:122 ACRES:44 VCU:447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 6/06/95
Silviculturist Date

Reviewed By: Ron Bockelman 6/06/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 123 **Acres: 10** **ALT: 2**
Net Sawlog Volume: 254 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

North (upper) boundary is located to exclude Class II-TTRA buffer. The southeast boundary follows proposed road and excludes area tributary to Class II TTRA buffers. The southwest boundary was located to create a rounded unit shape in response to visual concerns.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	A Class II stream is located close to southeast unit boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams are located in southern portion of the unit.
Mitigation:	Require directional falling away from Class III streams. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Unit has 10 acres of good value marten habitat and 10 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit is seen in middleground from Wrangell Narrows. Originally planned as 25 acres.
Mitigation:	Unit redesigned from 25 to 10 acres. Feather north, northwest, and southwest boundaries to reduce angular edge.

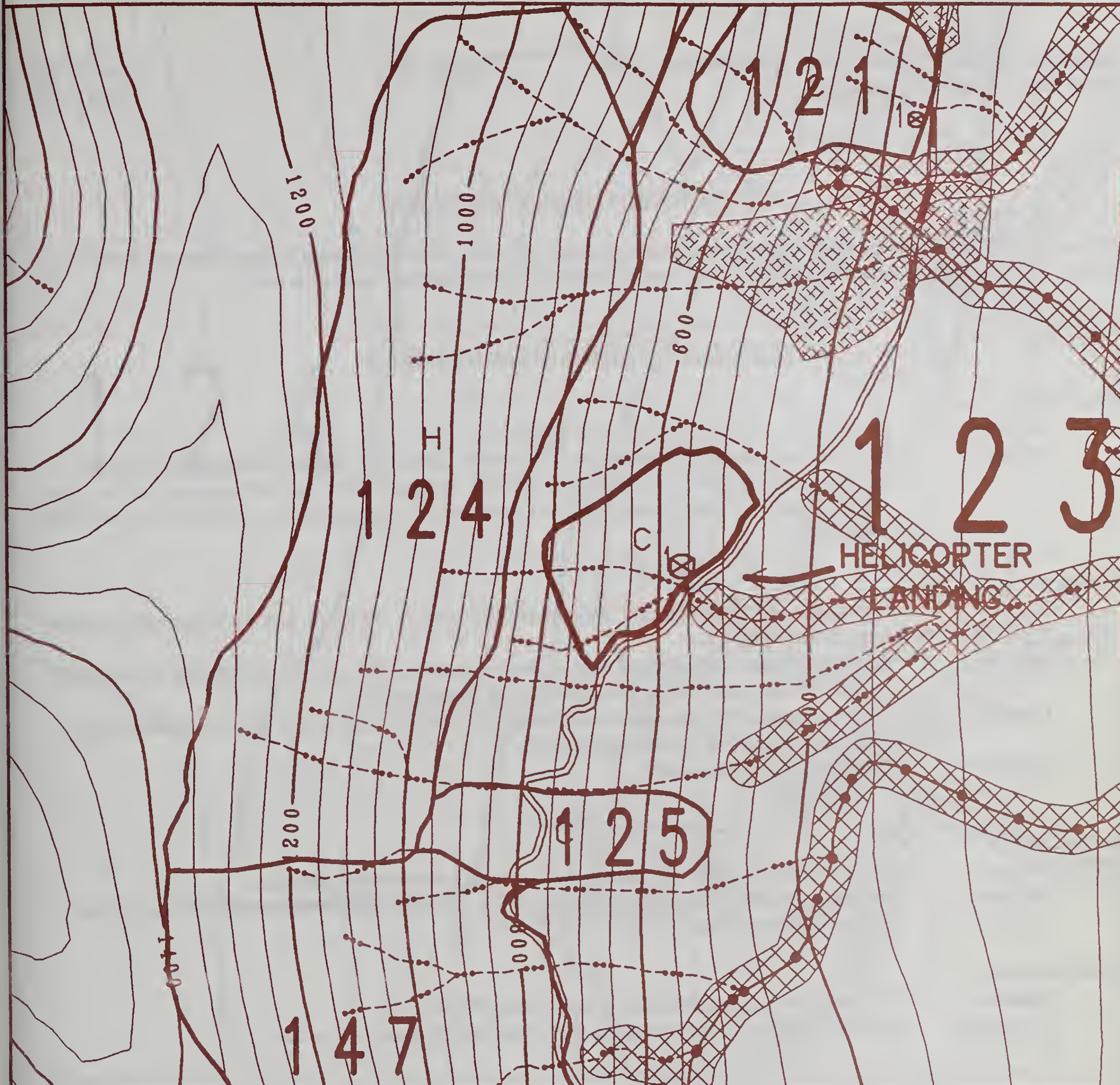
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 110 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Alaska-cedar decline in unit. Do not plant Alaska-cedar.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for a high lead yarding to one landing. This landing location will be used for helicopter yarding Unit 147.

AREA: S. LINDENBERG UNIT:123 ACRES:10 VCU: 447



N

- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

South Lindenberg Timber Sale Unit Number: 124 Acres: 86 ALT: 3,5
Net Sawlog Volume: 364 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The east boundary follows the upper logical cable yarding break. The south boundary follows a Class III stream channel and is common with north boundary of Unit 147. The west boundary follows slope break and scrub timber.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Several Class III streams are located within unit
Mitigation:	Require directional falling from Class III streams. Helicopter yarding would achieve full log suspension and minimize disturbance to streams. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Red-tailed hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.
Mitigation:	Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.
Concern:	Unit has 3 acres of good value marten habitat in the eastern end, and 21 acres of average value Sitka black-tailed deer habitat in the middle.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure in harvested openings.
Mitigation:	Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit seen in middleground from Wrangell Narrows.
Mitigation:	Harvest 13 acres in small groups (1.5 to 2.5 acres) distributed across unit.

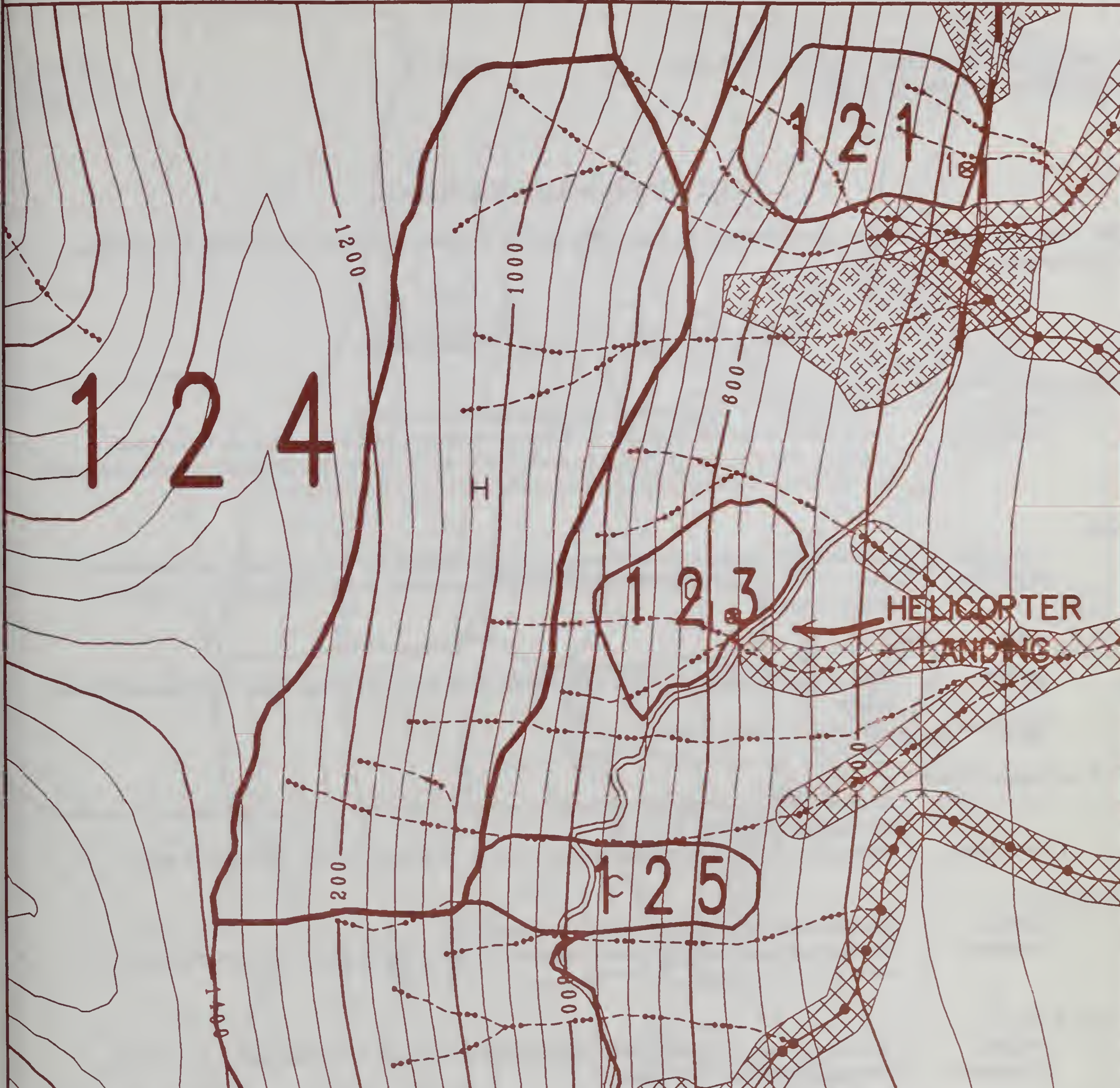
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Uneven Aged	Rotation Period: 180 years
Silvicultural Prescription:	Group Selection	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	None	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding (Alternatives 3 and 5) to the location of landing planned for Unit 123 (Alternative 2). Landing would cover 1 acre along proposed extension of Road 6355.

AREA: S. LINDENBERG UNIT:124 ACRES:86 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-195

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 125 **Acres: 9** **ALT: 2,5**
Net Sawlog Volume: 232 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north and south boundaries follow V-notch channels. Both the east and west ends of unit are tapered in response to visual concerns.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	V-notch channels form the north and south boundaries of unit.
Mitigation:	Do not harvest trees in inner gorge. Require directional falling of trees away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Unstable soils associated with V-notch channels adjacent to north and south unit boundaries.
Mitigation:	Trees will not be harvested on unstable soils. Require directional falling of trees away from stream channels.

Wildlife

Concern:	Unit has 6 acres of good value marten habitat and 6 acres of average value Sitka black-tailed deer habitat.
Mitigation:	this concern is not mitigated.

TES Animals and Plants:

Opportunity:	Historic nesting of ospreys has been documented in Green Rocks area, approximately 0.8 miles southeast of the unit.
Opportunity:	Retain three (3) large flat topped trees at east end of unit as potential nest or perch trees.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit seen in middleground from Wrangell Narrows. Originally planned as 17 acres.
Mitigation:	Unit redesigned from 17 to 9 acres.

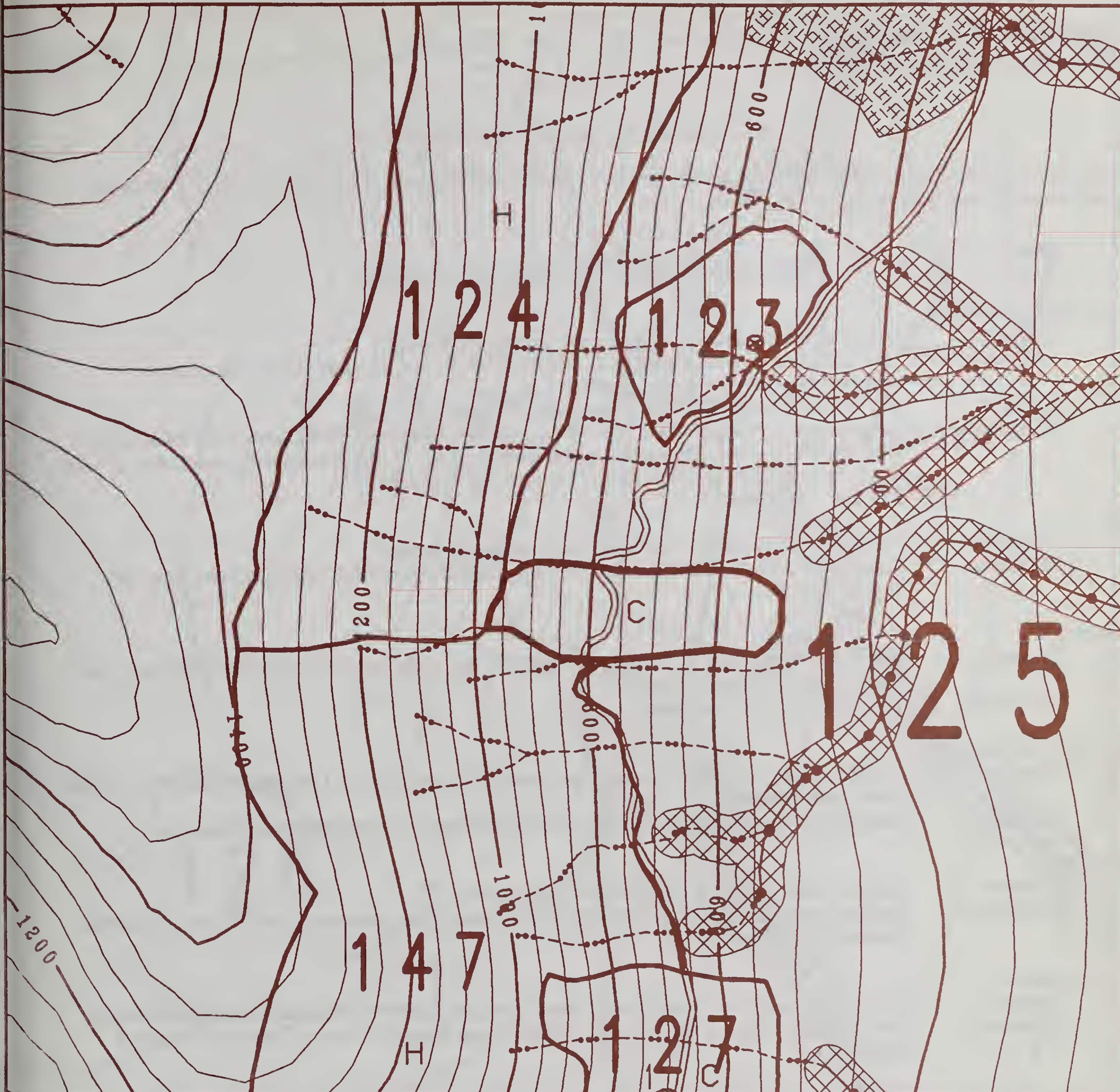
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 110 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed. Unit has undergone moderate sawfly/budworm defoliation	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for yarding by mobile yarder to proposed extension of Road 6355.

AREA: S. LINDENBERG UNIT:125 ACRES:9 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-194

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 127 Acres: 23 **ALT: 2,5**
Net Sawlog Volume: 421 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north, south and east boundaries are influenced by stream channels and the location of Class II streams. The upper (west) boundary undulates in response to visual concerns.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I and II streams are located close to east unit boundary.
Mitigation:	Unit boundary is located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	Several small Class III stream channels are located within unit.
Mitigation:	Require split yarding of Class III streams. Require directional falling from Class III streams. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Unstable soil conditions exist in convergent stream channels.
Mitigation:	Trees will not be harvested on unstable soils. Require directional falling of trees away from stream channels.

Wildlife

Concern:	Unit has 9 acres of good value marten habitat in the north, and 19 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals:

Concern:	Historic nesting of ospreys has been documented in Green Rocks Lake, approximately 0.6 miles to the east of the unit.
Mitigation:	Retain six (6) large flat topped trees in east end of unit as potential nest or perch trees.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Harvest unit is seen in middleground from Wrangell Narrows. Originally planned as 29 acres.
Mitigation:	Unit redesigned from 29 to 23 acres. Feather entire boundary west of Road 6355 to reduce angular edge.

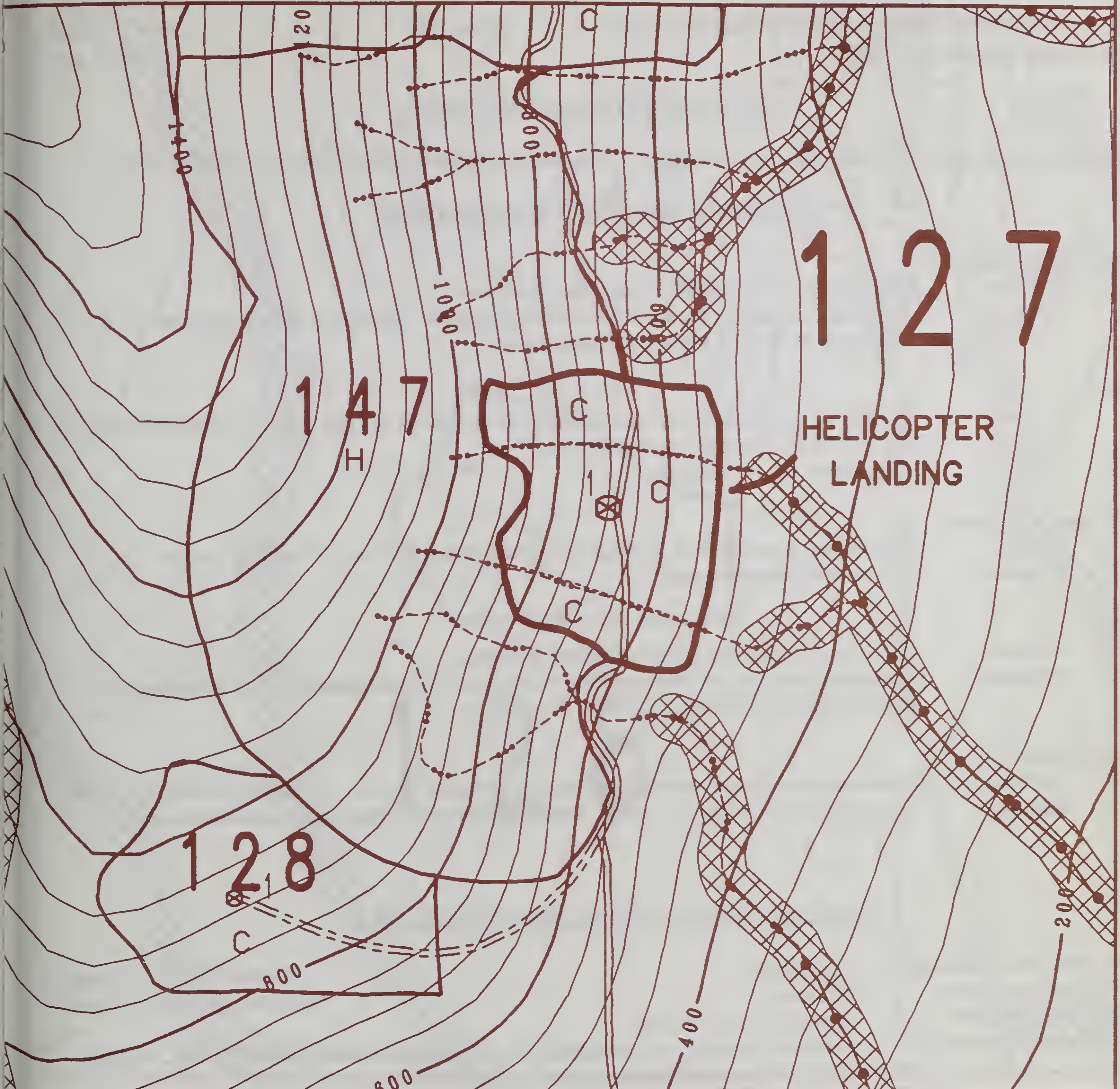
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 110 years
Silvicultural Prescription:	Group Selection	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Unit has undergone moderate defoliation by sawfly and budworm; widespread windthrow and numerous dead tops	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to one landing along proposed extension of Road 6355. Landing would be used for helicopter yarding (Alternatives 3 and 5) of Unit 147. Landing would cover 1 acre. A mobile yarder will operate on the north and south settings to avoid yarding across Class III streams.

AREA: S. LINDENBERG UNIT:127 ACRES:23 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 2/05/96
Silviculturist Date

Reviewed By: Martha Goodavish 2/05/96
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-194

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 128 **Acres: 23** **ALT: 2,3,5**
Net Sawlog Volume: 416 MBF **VCU: 447**

DEVELOPMENT OF UNIT BOUNDARY

The north and west boundaries follow logical slope breaks. The south boundary basically follows non-commercial forest.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries
- Concern: Proposed spur road crosses several Class III streams.
- Mitigation: Minimize the erosion effects of concentrated water flow. Riprap culvert inlets and outlets. Avoid channel width changes and protect embankments.

Wildlife
- Concern: Unit has 3 acres of good value marten habitat in the eastern end and 3 acres of average value Sitka black-tailed deer habitat in the northern end.
- Mitigation: This concern is not mitigated.

TES Plants and Animals
- Concern: Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
- Mitigation: This concern is not mitigated.

Biodiversity
- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources
- Concern: Harvest opening is seen in middleground from Wrangell Narrows. Originally planned as 43 acres.
- Mitigation: Unit redesigned from 43 to 23 acres. Feather upper (north) boundary to reduce angular edge.

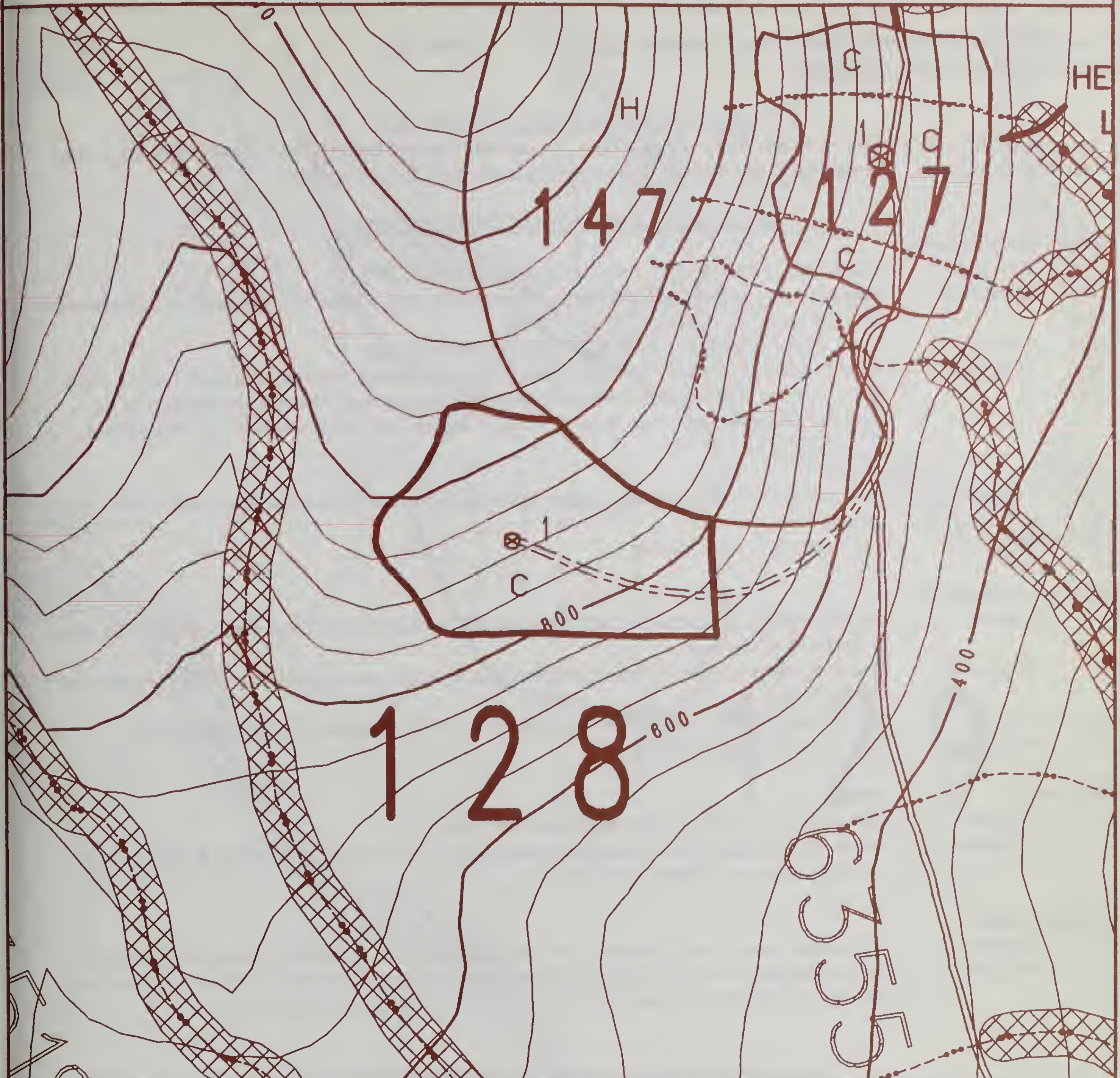
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 120 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed. Unit has undergone moderate budworm/sawfly defoliation

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to one landing. A 0.5 mile temporary spur road extending from proposed Road 6355 would provide access to landing. Two stream crossings would require: MP 0.2 - 48 inch pipe, MP 0.3 - 48 inch pipe.

AREA: S. LINDENBERG UNIT:128 ACRES:23 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 2/05/96
Silviculturist Date

Reviewed By: Martha Goodavish 2/05/96
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-194

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 129 Acres: 36 ALT: 2
Net Sawlog Volume: 895 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The northeast boundary follows a TTRA buffer and muskeg. The east and south boundaries follow muskeg openings and non-commercial forest. The west boundary follows logical yarding break and Class III stream.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I and II streams are located close to north portion of unit.
Mitigation:	Unit boundary was located to exclude TTRA buffer, plus additional area to reduce sedimentation into the stream channel.
Concern:	Class III streams are located in the northwest corner of unit.
Mitigation:	Require partial log suspension over Class III stream channel. Require directional falling away from Class III channel. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Unit has 36 acres of good value marten habitat and 36 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Historic nesting of ospreys has been documented in Green Rocks Lake, approximately 0.8 miles to the north of the unit.
Mitigation:	Retain at least six (6) large flat topped trees within reserve tree clumps to provide potential nesting or perch trees.
Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acre) along setting break to retain legacy of old growth stand structure.

Visual Resources

Concern:	Harvest unit seen in middleground from Wrangell Narrows. Originally planned as 33 acres.
Mitigation:	Unit redesigned from 33 to 26 acres. Feather south and west boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 110 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for slackline yarding to two landings. Two temporary roads (500 feet and 210 feet) extended from proposed Road 6355 would be constructed to provide access to the landings.

AREA: S. LINDENBERG UNIT:129 ACRES:36 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

3

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-193

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 133 Acres: 39 ALT: 2
Net Sawlog Volume: 1,380 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows muskeg and non-commercial forest. The west boundary follows non-commercial forest and Class III stream. The east boundary and portions of the south boundary follow a logical setting and slope break. The south boundary follows non-commercial forest and logical slope break. The east boundary follows logical setting break.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Several Class III streams are located within unit.
Mitigation:	Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern:	Harvest unit is located in proposed medium Wildlife Retention Area (WRA).
Mitigation:	No mitigation is planned under Alternative 2.
Concern:	Unit has 19 acres of good value marten habitat in the northeastern end, and 30 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acre) at the two setting breaks to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern:	Portion of unit is seen in middleground from Wrangell Narrows.
Mitigation:	Feather south and east boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 120 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	
Other Timber Considerations:	Monitor regeneration to determine if interplanting of Alaska-cedar is needed	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to three landings. Two landings would be located along proposed Road 43518; one landing would be located at end of temporary spur road (600 feet).

AREA: S. LINDENBERG UNIT:133 ACRES:39 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-193

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 134 Acres: 20 ALT: 2
Net Sawlog Volume: 440 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows a Class III stream and non-commercial forest. The south boundary follows Class III stream channel. The west boundary undulates above (west) proposed alignment of Road 6355.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class III streams are located near north and south boundaries.
Mitigation:	Require directional falling from Class III streams.

Soils

Concern:	Inclusions of high hazard soils are located within unit careful practices are needed.
Mitigation:	Require partial log suspension over unit. Careful practices are needed.

Wildlife

Concern:	Unit is located in proposed medium Wildlife Retention Area (WRA).
Mitigation:	No mitigation is planned under Alternative 2.
Concern:	Unit has 17 acres of good value marten habitat and 17 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

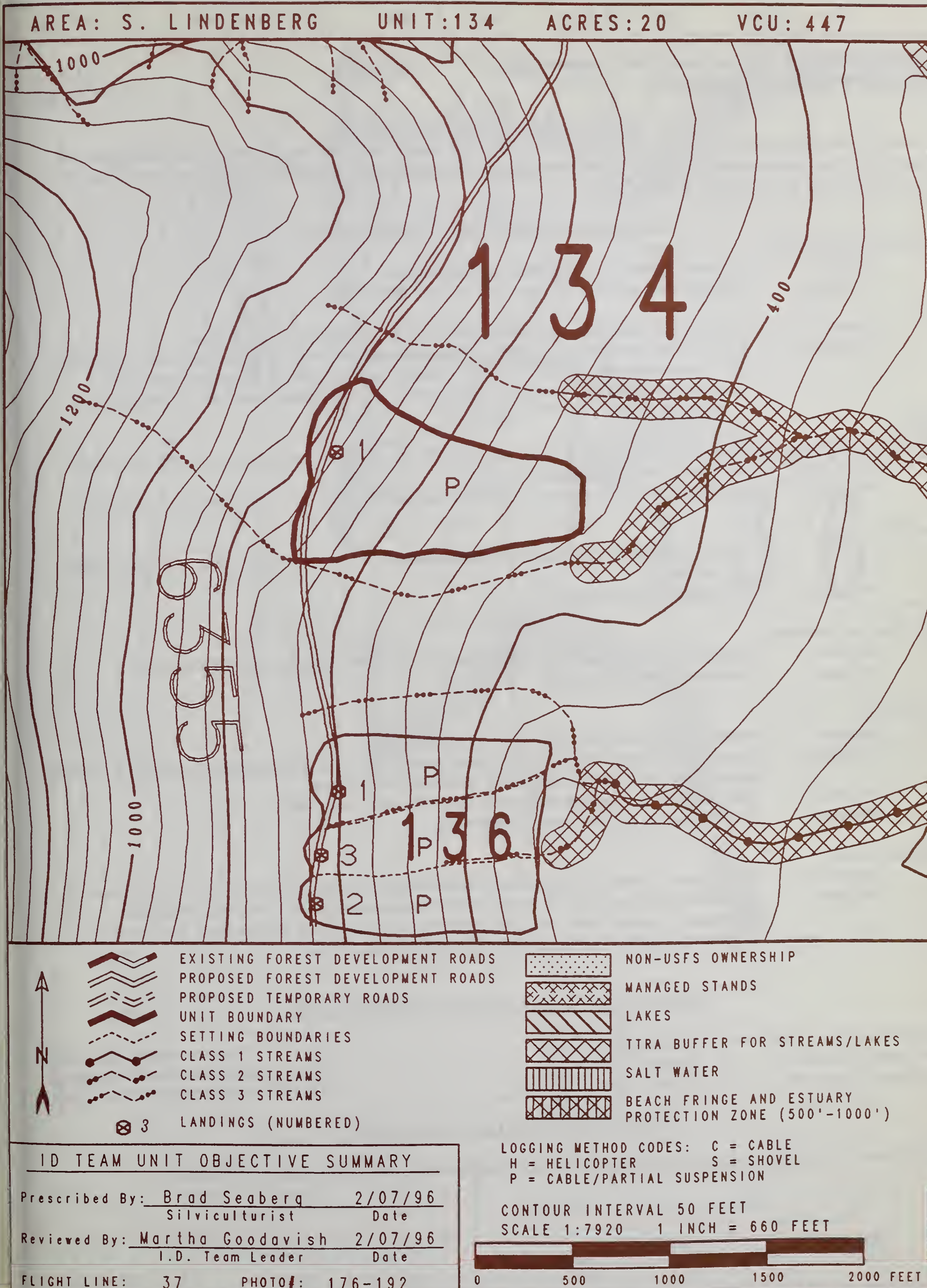
Concern:	Harvest unit seen in middleground from Wrangell Narrows. Originally planned as 22 acres.
Mitigation:	Unit redesigned from 22 to 20 acres. Western boundary scalloped to eliminate straight-line appearance. Feather north, west and south boundaries to reduce angular edge.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 120 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned to be uphill yarded to a slackline yarder at one landing along proposed extension of Road 6355.


AREA: S. LINDENBERG UNIT:134 ACRES:20 VCU: 447
1000
134
400
1200
1
P
635
1000
1
P
136
P
3
2
P
EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)
N
NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
ID TEAM UNIT OBJECTIVE SUMMARY
Prescribed By: Brad Seaberg 2/07/96
Silviculturist Date
Reviewed By: Martha Goodavish 2/07/96
I.D. Team Leader Date
FLIGHT LINE: 37 PHOTO#: 176-192
LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION
CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET
0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 136 Acres: 26 ALT: 2
Net Sawlog Volume: 1,042 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The north boundary follows close to a Class III stream. The west boundary undulates above (west) proposed alignment of Road 6355. The south boundary follows a logical setting break. The east boundary excludes a floodplain above Class II streams and forms a logical yarding break.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	A Class II stream is located close to east boundary.
Mitigation:	East boundary was located to exclude 100 ft-TTRA buffer.
Concern:	Several Class III streams are located within unit that flow into a Class I stream.
Mitigation:	Require full log suspension or split yarding at stream channels. Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern:	Small areas of Class III soils are located within unit. Current slide activity in area; steep slopes and exposed bedrock present.
Mitigation:	Require partial log suspension to minimize ground disturbance. Careful practices are needed.

Wildlife

Concern:	Unit has 24 acres of good value marten habitat and 26 acres of average value Sitka black-tailed deer habitat.
Mitigation:	This concern is not mitigated.

TES Plants and Animals

Concern:	Harvest may disturb nesting marbled murrelets, a former Category 2 candidate species.
Mitigation:	This concern is not mitigated.

Biodiversity

Concern:	Harvest would eliminate old growth stand structure.
Mitigation:	Locate two (2) reserve tree clumps (approximately 0.5 to 1.0 acre) along setting breaks to provide for structural diversity throughout the rotation life of the stand.
Concern:	Unit is located in proposed medium Wildlife Retention Area (WRA).
Mitigation:	No mitigation is planned under Alternative 2.

Visual Resources

Concern:	Harvest unit is seen in middleground from Wrangell Narrows. Originally planned as 39 acres.
Mitigation:	Unit redesigned from 39 to 26 acres. West boundary scalloped to eliminate straight-line appearance. Feather north, west and south boundaries to reduce angular edge. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period: 120 years
Silvicultural Prescription:	Clearcut	Regeneration Method: Natural
Anticipated Treatments:	Precommercial Thinning	Other Timber Considerations: None

PROPOSED ACTION OR DEVELOPMENT

Unit is planned to be uphill yarded to slackline yarder at three landings along proposed extension of Road 6355.

AREA: S. LINDENBERG UNIT:136 ACRES:26 VCU: 447

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 2/07/96
Silviculturist Date

Reviewed By: Martha Goodavish 2/07/96
I.D. Team Leader Date

FLIGHT LINE: 37 PHOTO#: 176-192

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 138 Acres: 17 ALT: 2,3,4,5
Net Sawlog Volume: 277 MBF VCU: 437

DEVELOPMENT OF UNIT BOUNDARY

The northwest boundary follows edge of managed stand. Remaining boundaries follow muskeg and scrub timber.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Small Class III stream parallels the south boundary.

Mitigation: Require directional falling away from Class III stream channel. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern: Unit has 5 acres of good value marten habitat in the northwestern end.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Leave one (1) reserve tree clump (approximately 0.5 to 1.0 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

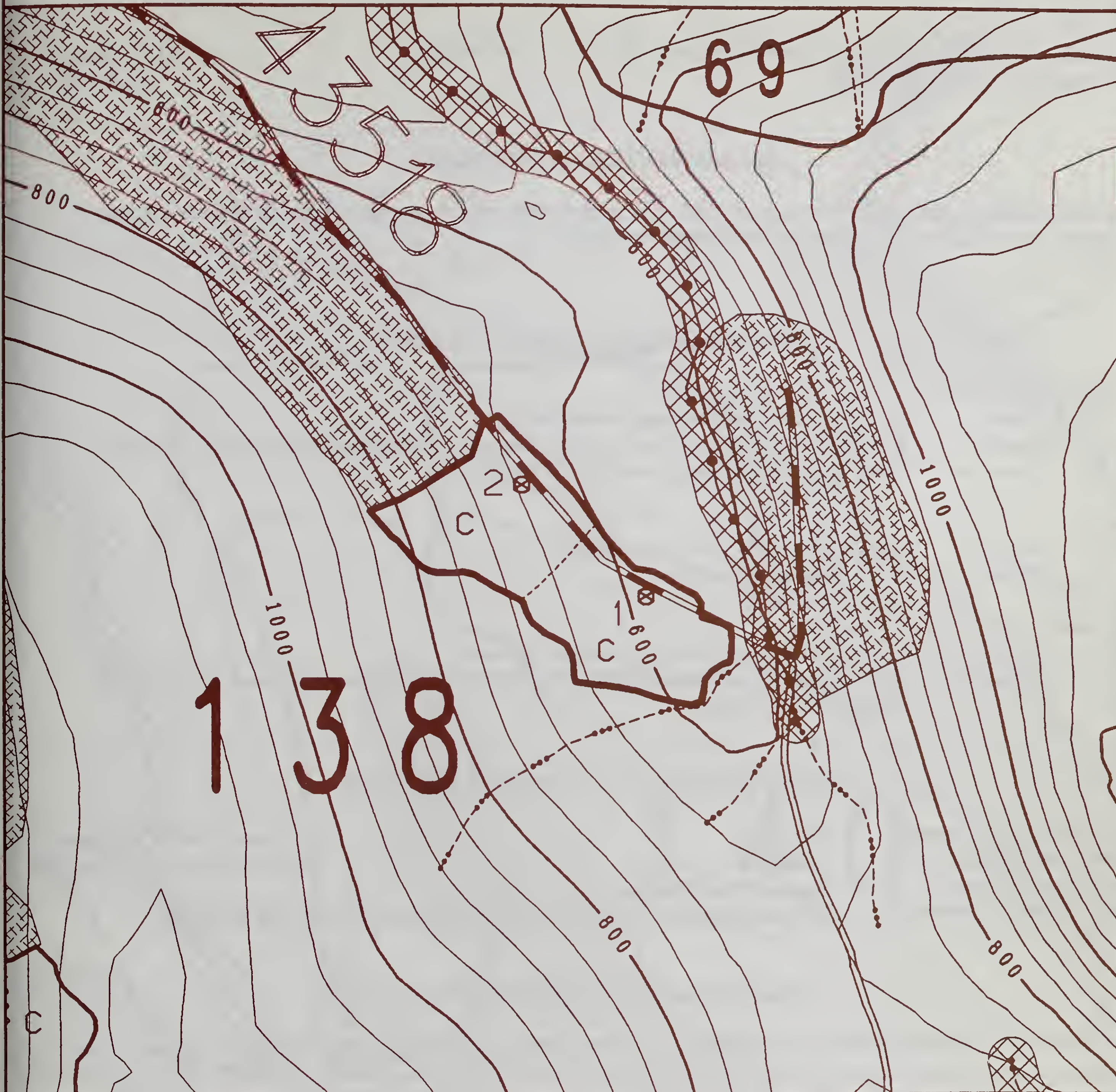
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings along existing Road 43518.

AREA: S. LINDENBERG UNIT:138 ACRES:17 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-181

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale **Unit Number: 140** **Acres: 37** **ALT: 2,3,4,5**
Net Sawlog Volume: 738 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The north boundary closely follows the existing road. The east boundary follows a managed stand. The south and west boundaries follow logical slope breaks and non commercial timber.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries
- Concern: Several small streams are located within unit.
- Mitigation: Retain large woody, material and remove small woody debris immediately following yarding. Existing natural, stable debris would be left undisturbed.

Wildlife
- Concern: Unit has 25 acres of good value marten habitat.
- Mitigation: This concern is not mitigated.

Biodiversity
- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

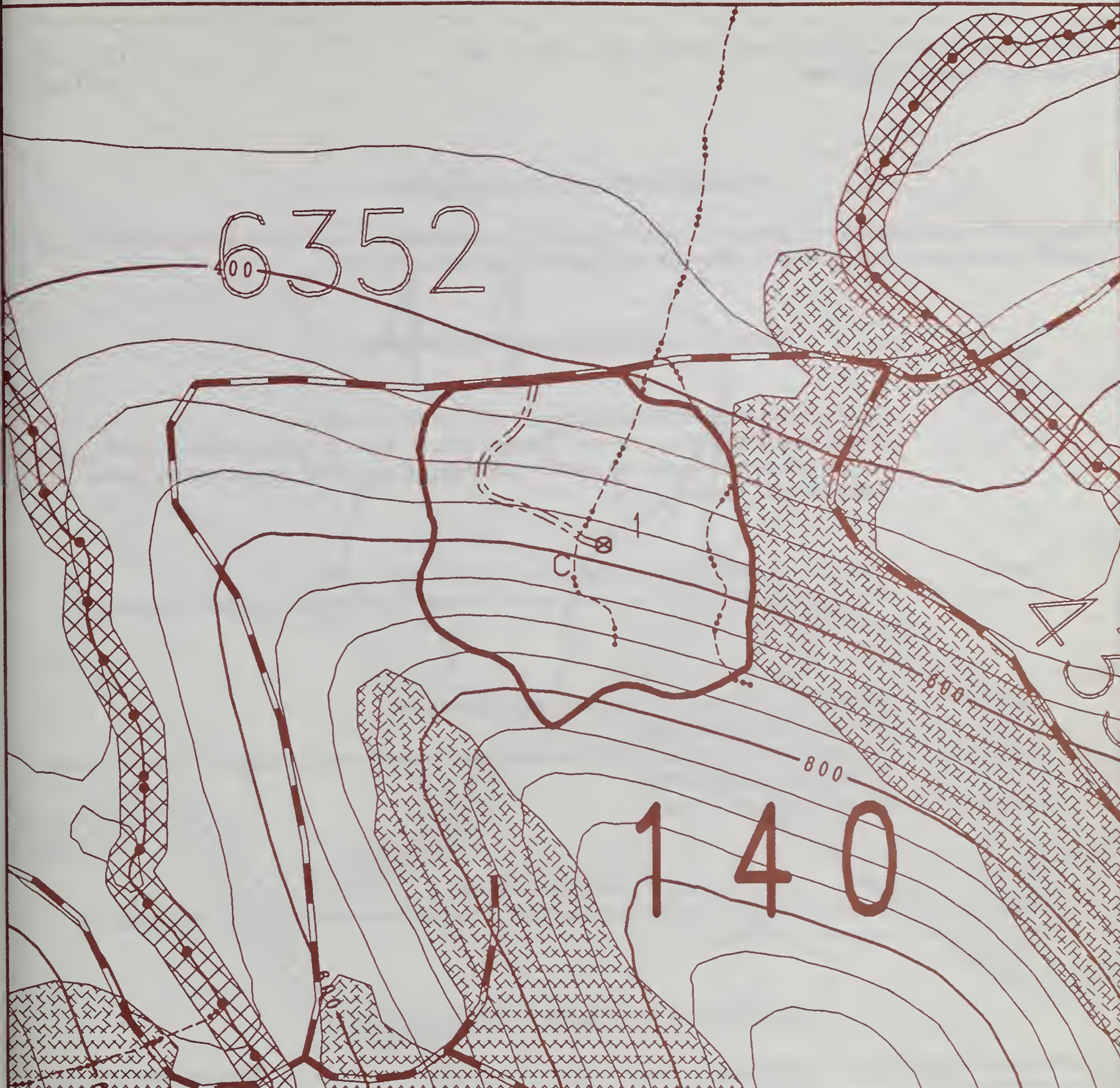
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Even Aged — Rotation Period: 100 years
Silvicultural Prescription: Clearcut — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: Monitor regeneration to determine if interplanting of Alaska-cedar is needed.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for highlead yarding to one landing. A 0.2 mile temporary road would be needed to access landing.

AREA: S. LINDENBERG UNIT:140 ACRES:37 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 36 PHOTO#: 176-180

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 141 Acres: 23 **ALT: 2,3,4,**
Net Sawlog Volume: 354 MBF **VCU:437**

DEVELOPMENT OF UNIT BOUNDARY

Portions of the west boundary follow a managed stand boundary. The north boundary avoids a slide area and ties into Class III stream at the northeast corner. East boundary follows Class III channel to Road 6350.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Deeply incised, unstable Class III channel forms the eastern boundary.

Mitigation: Require directional falling away from channel incision. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Soils

Concern: Originally planned layout contained area with recent slope failure.

Mitigation: Unit boundary was located to exclude areas associated with recent slope failure (northwest of unit).

Wildlife

Concern: Harvest unit is located within goshawk post fledgling area.

Mitigate: This concern is not mitigated.

Concern: Unit has 6 acres of good value marten habitat and 6 acres of average value Sitka black-tailed deer habitat in the northeastern end.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

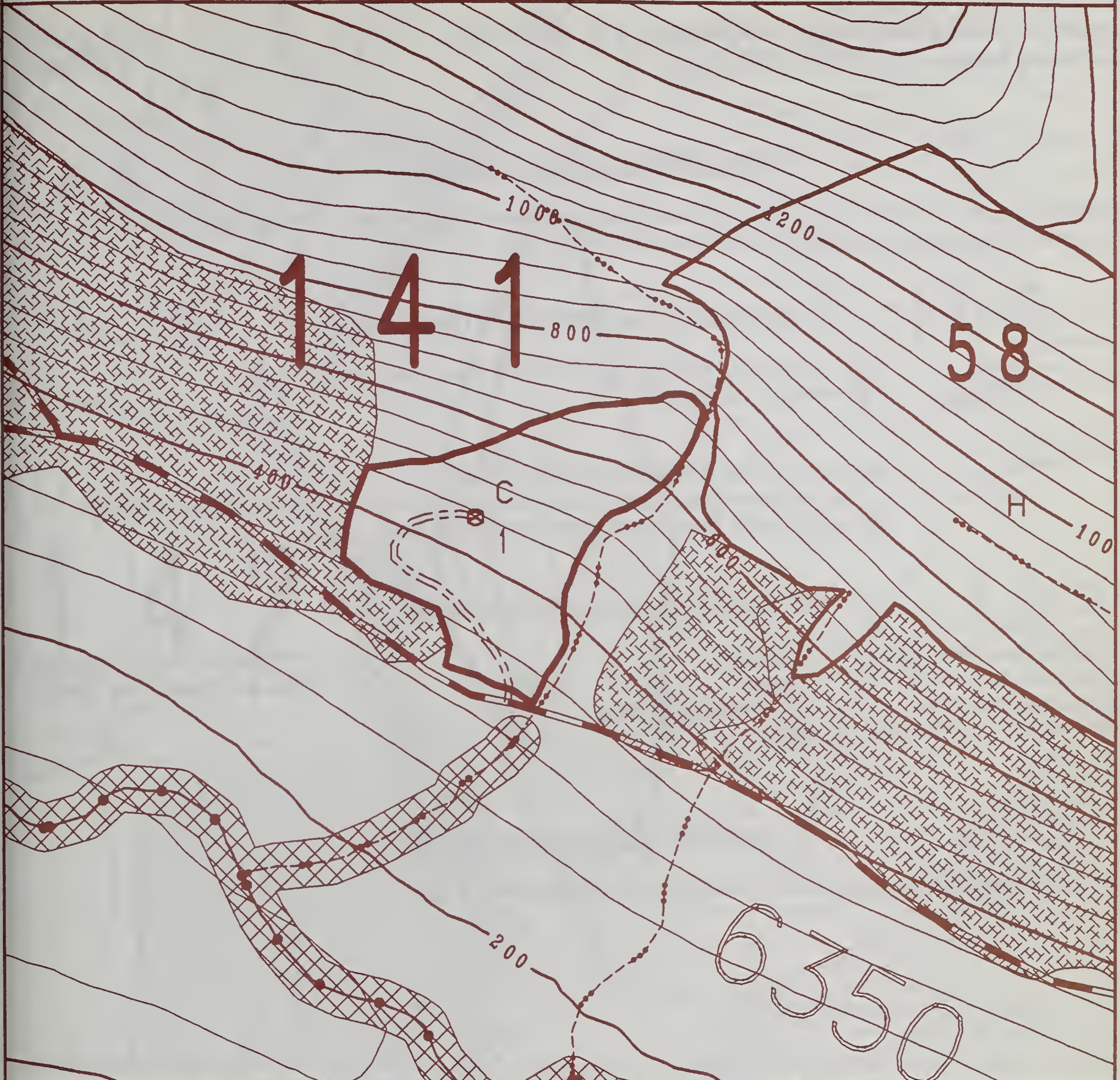
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 80 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to one landing. A 0.3 mile temporary road would be needed to access landing.

AREA: S. LINDENBERG UNIT:141 ACRES:23 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS	NON-USFS OWNERSHIP
PROPOSED FOREST DEVELOPMENT ROADS	MANAGED STANDS
PROPOSED TEMPORARY ROADS	LAKES
UNIT BOUNDARY	TTRA BUFFER FOR STREAMS/LAKES
SETTING BOUNDARIES	SALT WATER
CLASS 1 STREAMS	BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')
CLASS 2 STREAMS	
CLASS 3 STREAMS	
⊗ 3 LANDINGS (NUMBERED)	

N

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 33A PHOTO#: 176-75

South Lindenberg Timber Sale Unit Number: 142 Acres: 42 **ALT: 2,3,4,5**
et Sawlog Volume: 784 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows a logical slope break and avoids over-steepened slopes above a Class I stream. The east boundary follows a logical yarding break above proposed Road 43520.

RESOURCE CONCERNS AND MITIGATIONS

Wildlife:

Concern: Unit has 7 acres of good value marten habitat in the western end.
Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.
Mitigation: Locate two reserve tree clumps (approximately 0.5 to 1.0 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

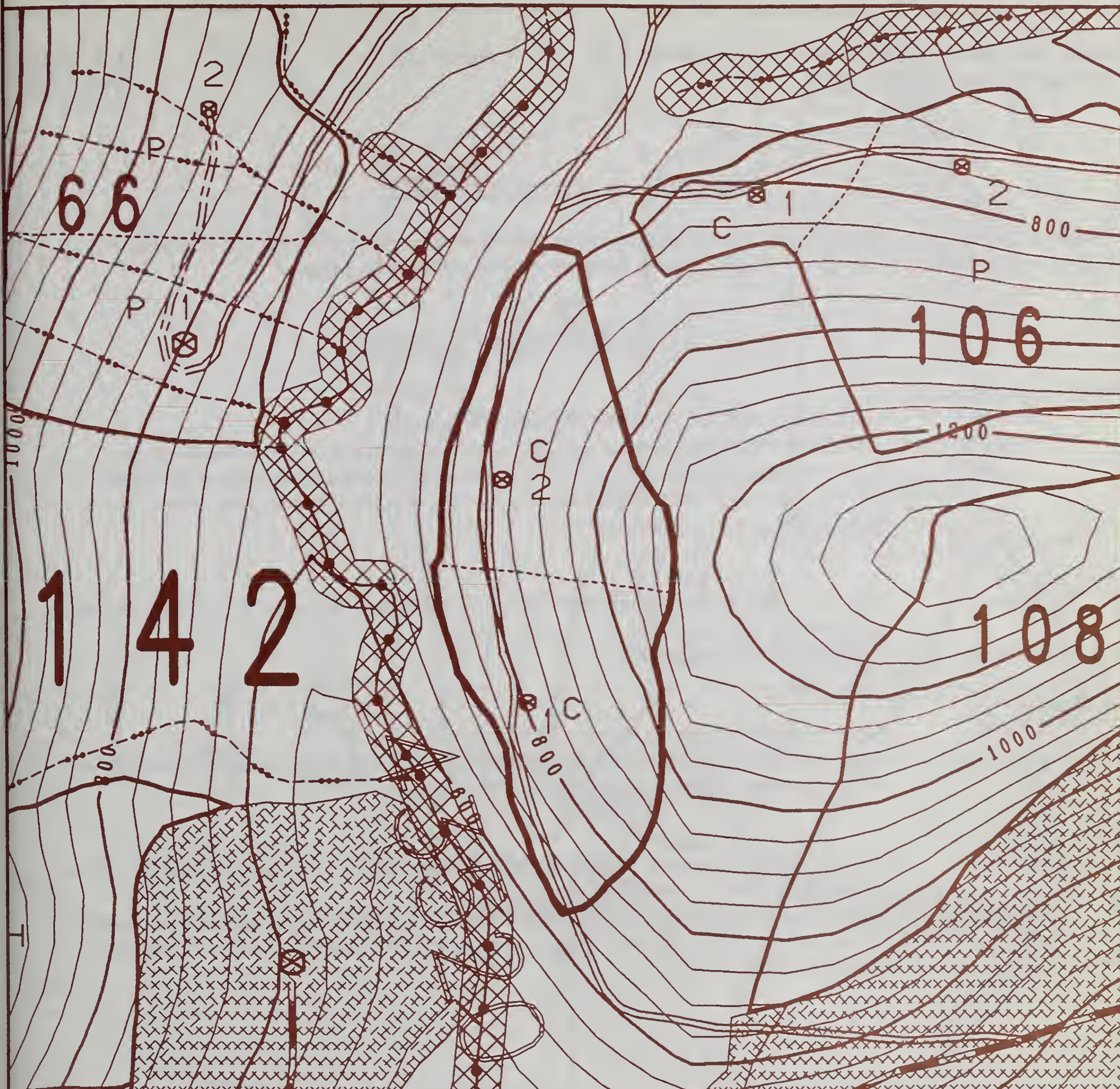
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings along proposed Road 43520.

AREA: S. LINDENBERG UNIT:142 ACRES:42 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg (Silviculturist) — Date: 6/06/95

Reviewed By: Ron Bockelman (I.D. Team Leader) — Date: 6/06/95

FLIGHT LINE: 37 PHOTO#: 176-197

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 145 **Acres: 25** **ALT: 2,4,5**
Net Sawlog Volume: 621 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

The lower (east boundary) follows a logical slope break common with the west boundary of Unit 67. North boundary follows south boundary of Unit 68. The west and south boundary exclude oversteepened slopes.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Several unstable Class III streams are located within unit.

Mitigation: Helicopter yarding would provide full log suspension and minimize disturbance to stream. Require directional falling away from stream channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed.

Wildlife

Concern: Unit has 12 acres of good value marten habitat and 12 acres of average value Sitka black-tailed deer habitat in the eastern end.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Locate two reserve tree clumps (approximately 0.5 to 1.0 acre) on upper slopes to provide for structural diversity throughout the rotation life of the stand.

Visual Resources

Concern: Cumulative size of Units 67, 68, 145 and existing harvested opening exceeds 100 acres. Unit is not seen from sensitive viewing areas.

Mitigation: Feather west unit boundary to reduce angular edge. Use natural features and breaks to locate clumps proposed for biodiversity mitigation. Reserve tree clumps proposed for biodiversity will also reduce visual impacts.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

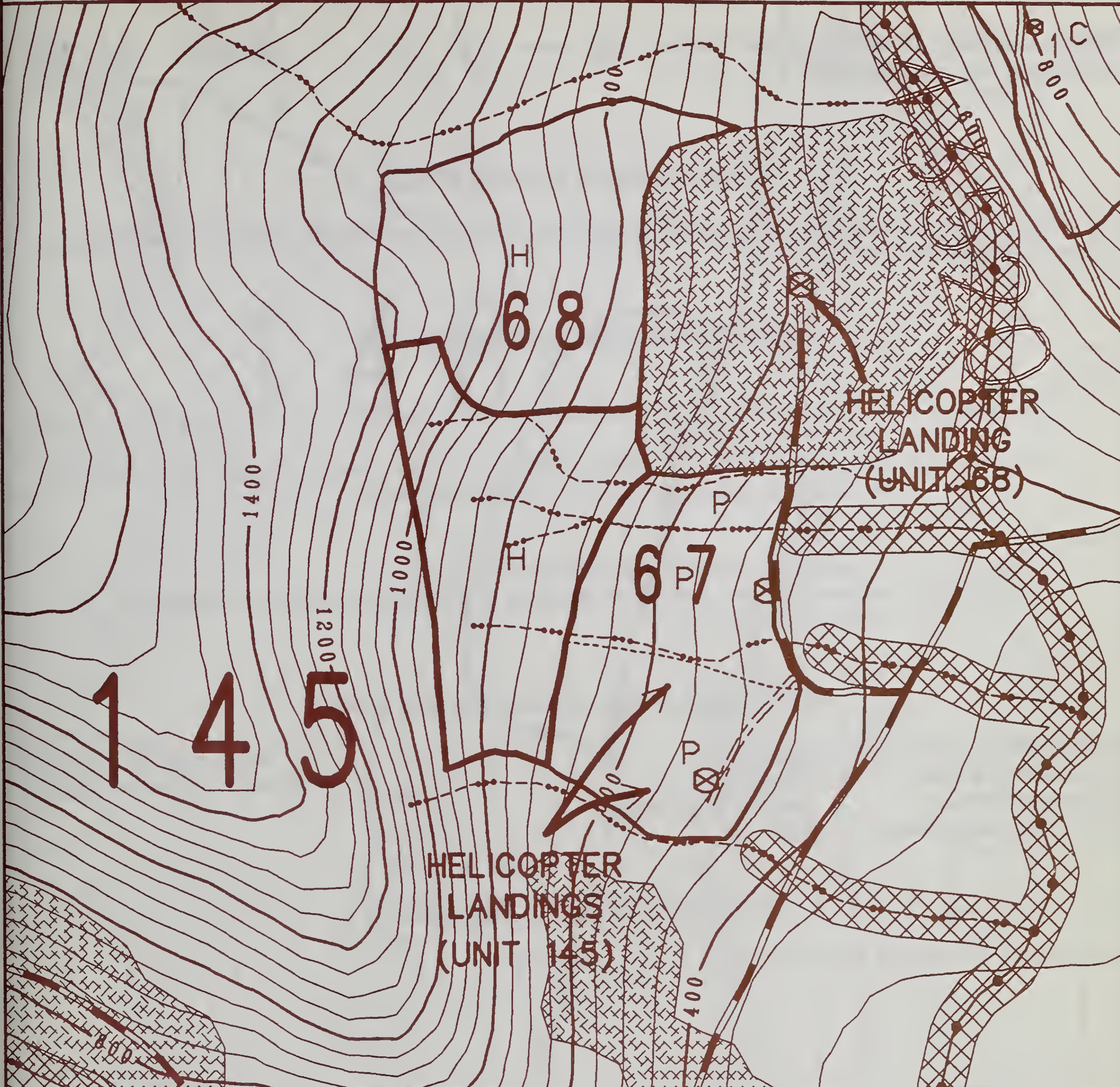
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None

Rotation Period: 120 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to either one of the high-lead landings proposed for Unit 67.

AREA: S. LINDENBERG UNIT:145 ACRES:25 VCU: 437



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg	3/10/95
	Silviculturist	Date
Reviewed By:	Jeff Barrett	3/10/95
	I.D. Team Leader	Date

FLIGHT LINE: 36 PHOTO#: 177-178

South Lindenberg Timber Sale Unit Number: 146 Acres: 27 **ALT: 2,3,4**
Net Sawlog Volume: 334 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

The south, west and north boundaries follow a logical yarding break and timber type changes. The east boundary follows location of existing Road 6359.

RESOURCE CONCERNS AND MITIGATIONS

Wildlife

Concern: Sharp-shined hawk activity in unit suggests possible nesting within the vicinity of the unit, however no nests were found.

Mitigation: Nest searches will be conducted prior to implementation. If a nest is located within or adjacent to the unit, the Regional Raptor guidelines will be implemented.

Biodiversity

Concern: Harvest would eliminate old growth stand structure.

Mitigation: Minimize damage to non-merchantable trees to provide for structural diversity throughout the rotation life of the stand.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

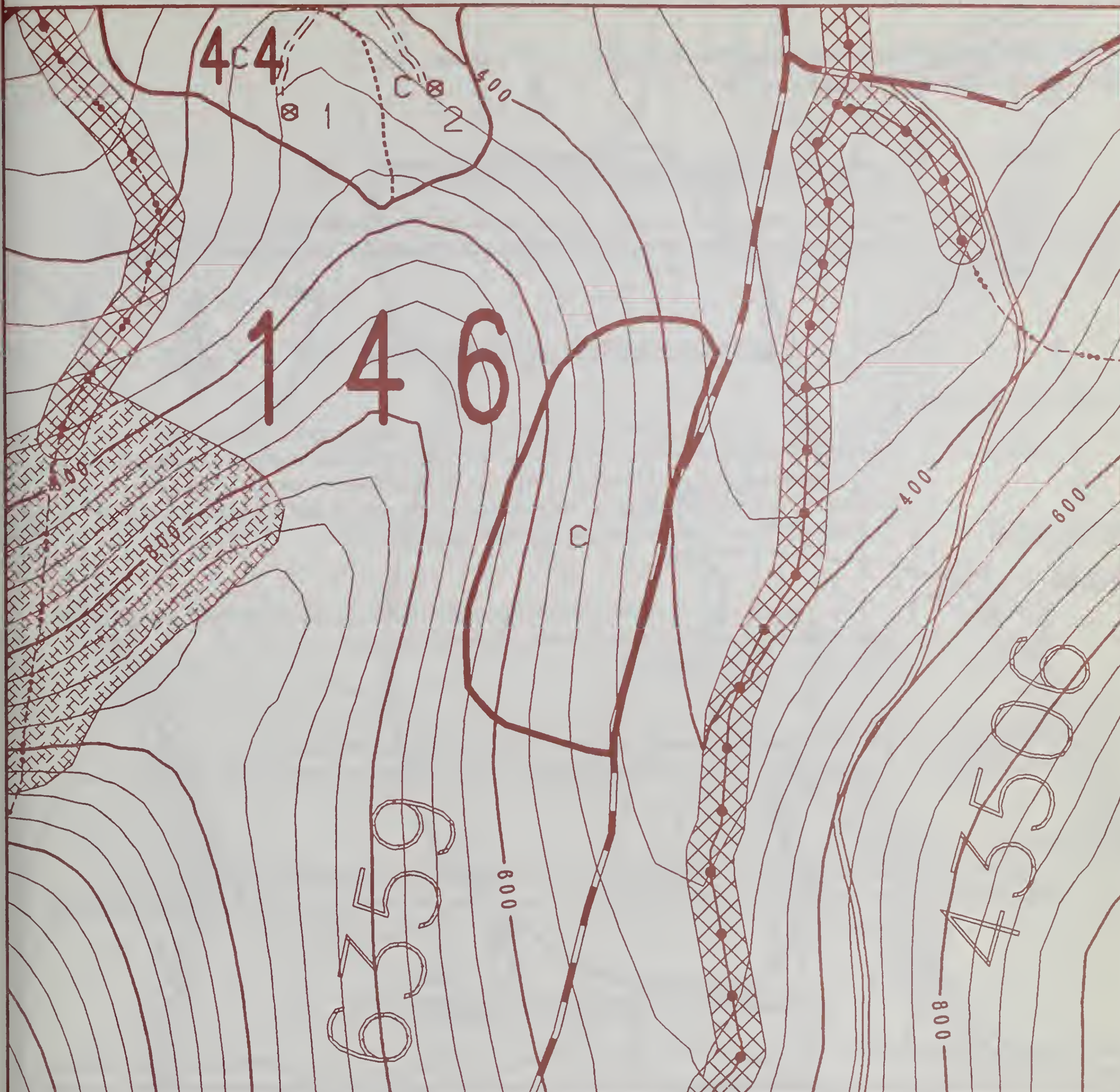
Stand Management Objectives: Even Aged
Silvicultural Prescription: Clearcut
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: None.

Rotation Period: 100 years
Regeneration Method: Natural

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for yarding to mobile yarder along existing Road 6359.

AREA: S. LINDENBERG UNIT:146 ACRES:27 VCU: 439



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
⊗ 3 LANDINGS (NUMBERED)

N

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By:	Brad Seaberg	3/10/95
	Silviculturist	Date
Reviewed By:	Jeff Barrett	3/10/95
	I.D. Team Leader	Date

FLIGHT LINE: 32A PHOTO#: 176-71

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 147 Acres: 112 ALT: 3,5
Net Sawlog Volume: 474 MBF VCU: 447

DEVELOPMENT OF UNIT BOUNDARY

The west boundary follows ridge top, slope breaks and noncommercial timber. The south boundary follows northeast boundary of Unit 128. The east boundary follows proposed road alignment of Road 6355 and portions of boundaries of Units 127 and 125.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern: Several Class III streams are located in unit which flow directly into a Class I stream.

Mitigation: Helicopter yarding will achieve full log suspension and minimize disturbance to streams. Require directional falling away from channels. Remove debris created by harvest activities that would degrade the quantity and quality of water flow. Existing natural, stable debris would be left undisturbed. Locate harvest groups away from stream channels.

Wildlife

Concern: Unit has 14 acres of good value marten habitat in the eastern end and 42 acres of average value Sitka black-tailed deer habitat in the eastern and northern ends.

Mitigation: This concern is not mitigated.

Biodiversity

Concern: Harvest would eliminate old growth stand structure in harvested openings.

Mitigation: Minimize disturbance to non-merchantable trees to provide structural diversity throughout the rotation life of the stand.

Visual Resource

Concern: Harvest unit seen in middleground from Wrangell Narrows. Originally planned as clearcut.

Mitigation: Unit redesigned as group selection. Harvest 17 acres in small groups (1.5 to 2.5 acres) distributed across the unit.

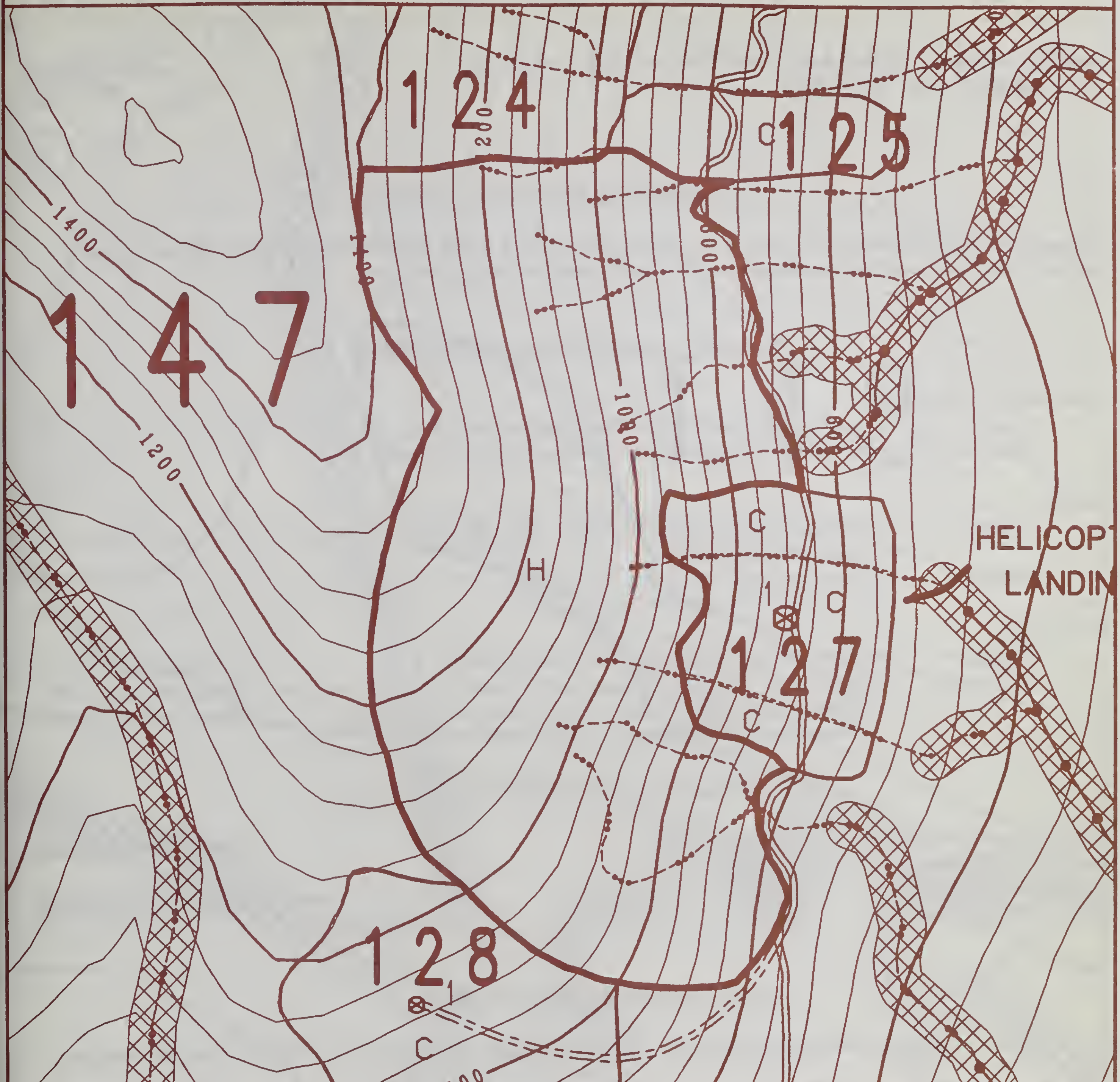
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives: Uneven Aged — Rotation Period: 160 years
Silvicultural Prescription: Group Selection — Regeneration Method: Natural
Anticipated Treatments: Precommercial Thinning
Other Timber Considerations: The unit has undergone moderate budworm/sawfly defoliation.

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to Landing 1 in Unit 127.

AREA: S. LINDENBERG UNIT:147 ACRES:112 VCU: 447



EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg — Silviculturist — 2/05/96 Date

Reviewed By: Martha Goodavish — I.D. Team Leader — 2/05/96 Date

FLIGHT LINE: 37 PHOTO#: 176-194

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 148 Acres: 31 **ALT: 2,3,4,5**
Net Sawlog Volume: 491 MBF **VCU: 437**

DEVELOPMENT OF UNIT BOUNDARY

Southwest boundary follows non-commercial forest and Class I TTRA buffer. The northeast boundary follows logical yarding break. The south boundary follows edge of small natural second-growth stand.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

- Concern: Class I stream is located near northwest portion of unit.
- Mitigation: Unit boundary was located to exclude 100-ft. TTRA buffer.

Wildlife

- Concern: Unit has 8 acres of good value marten habitat and 3 acres of average value Sitka black-tailed deer habitat in the western end.
- Mitigation: This concern is not mitigated.

Biodiversity

- Concern: Harvest would eliminate old growth stand structure.
- Mitigation: Locate one (1) reserve tree clump (approximately 0.5 to 1.0 acre) along setting break to provide for structural diversity throughout the rotation life of the stand.

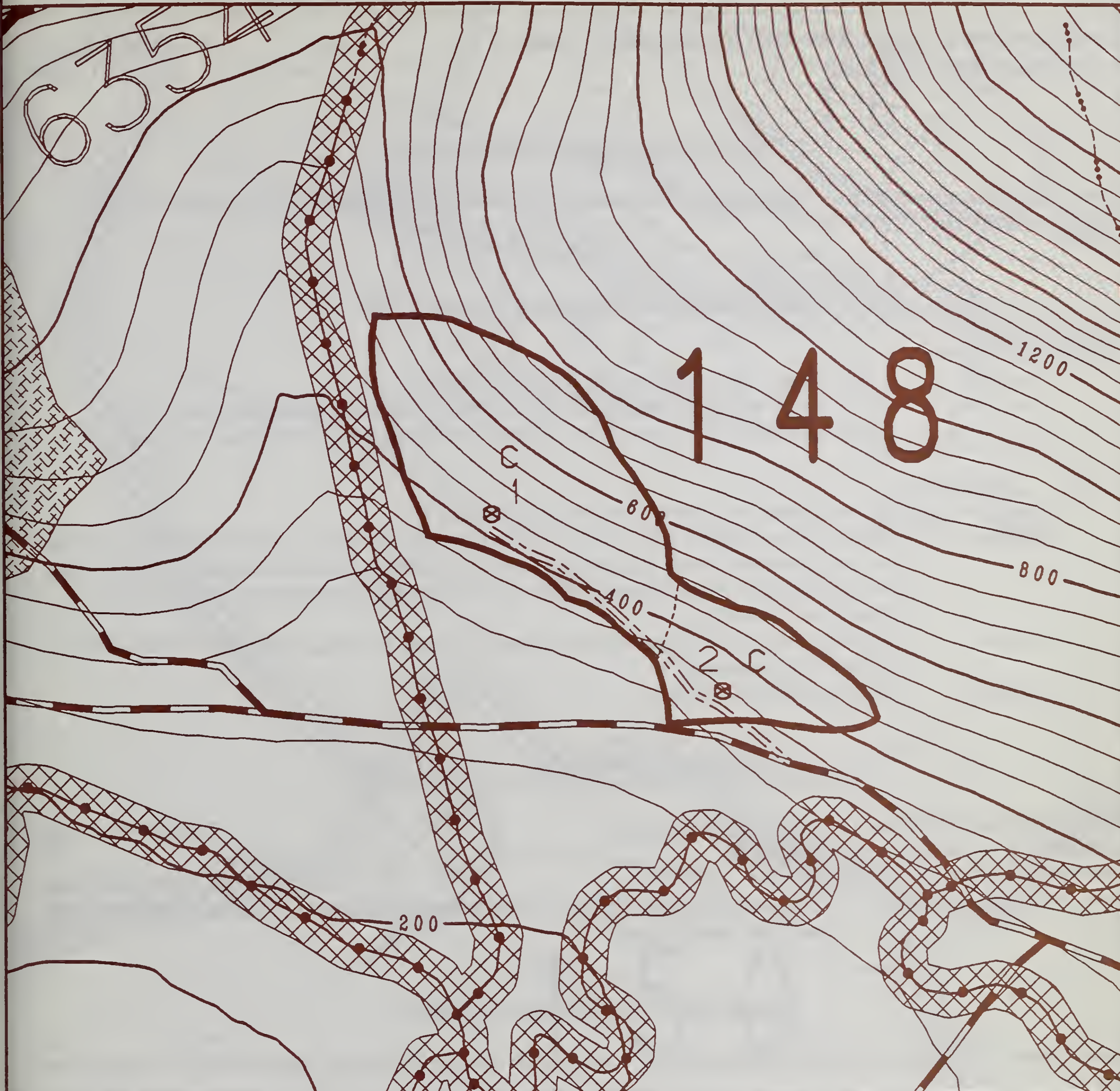
DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Even Aged	Rotation Period:	80 years
Silvicultural Prescription:	Clearcut		
Regeneration Method:	Natural	Anticipated Treatments:	Precommercial Thinning
Other Timber Considerations:	None		

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for high lead yarding to two landings. A 0.2 mile temporary road would be needed to access two landings.

AREA: S. LINDENBERG UNIT:148 ACRES:31 VCU: 437



N

- EXISTING FOREST DEVELOPMENT ROADS
- PROPOSED FOREST DEVELOPMENT ROADS
- PROPOSED TEMPORARY ROADS
- UNIT BOUNDARY
- SETTING BOUNDARIES
- CLASS 1 STREAMS
- CLASS 2 STREAMS
- CLASS 3 STREAMS
- ⊗ 3 LANDINGS (NUMBERED)
- NON-USFS OWNERSHIP
- MANAGED STANDS
- LAKES
- TTRA BUFFER FOR STREAMS/LAKES
- SALT WATER
- BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 35 PHOTO#: 176-130

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

South Lindenberg Timber Sale Unit Number: 150 Acres: 4 **ALT: 2,3,4,5**
Net Sawlog Volume: 34 MBF **VCU: 439**

DEVELOPMENT OF UNIT BOUNDARY

West unit boundary closely follows TTRA buffer along Duncan Creek. Remaining boundaries follow extent of dwarf-mistletoe infected stand.

RESOURCE CONCERNS AND MITIGATIONS

Water Quality/Fisheries

Concern:	Class I stream is located adjacent to west unit boundary.
Mitigation:	Unit boundary was located to exclude 100-ft. TTRA buffer, plus additional area to reduce sedimentation into the stream channel. Require directional falling away from TTRA buffer.

Wildlife

Concern:	Active goshawk nest found in the vicinity of the unit.
Mitigation:	Prior to implementation, field reviews of the known nest site will be completed to determine if the nest has been active during the past two seasons. If nesting activity has occurred during this time, harvesting activity and helicopter logging will be prohibited during the active nesting season (March 1 to August 15).
Concern:	Unit has 4 acres of good value marten habitat and 3 acres of average value Sitka black-tailed deer habitat in the western end.
Mitigation:	This concern is not mitigated.

DESCRIPTION OF UNIT ATTRIBUTES/OBJECTIVES

Stand Management Objectives:	Individual Tree Selection	Rotation Period: NA
Silvicultural Prescription:	Sanitation	
Regeneration Method:	Natural	Anticipated Treatments: None
Other Timber Considerations:	Heavy dwarf mistletoe infection; harvest is designed to remove highly infected trees and maintain stand structure.	

PROPOSED ACTION OR DEVELOPMENT

Unit is planned for helicopter yarding to a landing located east of the intersection of proposed Roads 43500 and 43503 within Unit 16.

AREA: S. LINDENBERG UNIT:150 ACRES:4 VCU:439

EXISTING FOREST DEVELOPMENT ROADS
PROPOSED FOREST DEVELOPMENT ROADS
PROPOSED TEMPORARY ROADS
UNIT BOUNDARY
SETTING BOUNDARIES
CLASS 1 STREAMS
CLASS 2 STREAMS
CLASS 3 STREAMS
3 LANDINGS (NUMBERED)

NON-USFS OWNERSHIP
MANAGED STANDS
LAKES
TTRA BUFFER FOR STREAMS/LAKES
SALT WATER
BEACH FRINGE AND ESTUARY PROTECTION ZONE (500'-1000')

N

ID TEAM UNIT OBJECTIVE SUMMARY

Prescribed By: Brad Seaberg 3/10/95
Silviculturist Date

Reviewed By: Jeff Barrett 3/10/95
I.D. Team Leader Date

FLIGHT LINE: 32 PHOTO#: 1076-111

LOGGING METHOD CODES: C = CABLE
H = HELICOPTER S = SHOVEL
P = CABLE/PARTIAL SUSPENSION

CONTOUR INTERVAL 50 FEET
SCALE 1:7920 1 INCH = 660 FEET

0 500 1000 1500 2000 FEET

Appendix B

Road Descriptions

Appendix B

Road Descriptions

The following is a summary of interdisciplinary team (IDT) field location and analysis of the proposed road segments in each of the action alternatives (2,3,4 and 5) discussed in the EIS. These descriptions are not "road cards," but a description of each road segment based on information gathered during the field reconnaissance conducted between May and July 1994. These descriptions would be used during the layout and harvest of units, and the survey and construction of the roads in the selected alternative. The road descriptions also summarize the Road Management Objectives (RMO's) for each road prescribed by the Forest Leadership Team.

A map showing the entire planned road network and five larger scale maps showing a more detailed layout of the roads are found at the end of the Appendix. The map number(s) for each road segment is shown in the upper right. Critical areas are referenced between the maps and road descriptions using a sequential numbering system (CA-1, CA-2, etc.).

Each road description shows where construction activities would need to be restricted to prevent damage to fisheries. Timing restrictions only apply to in-stream work where water quality standards would not be compromised. "Timing windows" to allow instream construction of crossings would be May 15 to August 15.

Closures would apply to in-stream construction activities on Class I streams and on Class II and III streams that are within 0.25 miles of potential spawning areas. Deviation from this timing window would require consultation with ADF&G. Special mitigation measures would be applied while operating in these streams during "timing windows." These measures could include placing silt fences adjacent to culverts to adsorb the sediment input, using bottomless arches or bridges, and reducing the crossing of the stream by construction equipment to the minimum while placing the culvert. BMP 14.6 would apply.

All Class I streams will require salmon fry passage through the structures, and all Class II streams will require the passage of resident fish. Preliminary engineering recommendations have made for drainage structure at stream crossings, however, final structure design will depend on cost as well as meeting resource objectives.

In addition to the following Planned Road Descriptions, more detailed information is found on the Road Design Cards found in the South Lindenberg planning file. Road Design Cards cover specific portions of each road. IDT members have listed areas of concern, management objectives, and mitigation measures.

Proposed mitigation measures for temporary roads planned for use are contained in the "Unit Descriptions" Appendix A.

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43500 **ROAD NAME:** GRACKLE **NEPA:** ___ **MAP:** 1

TERMINI: 3.7

LENGTH(MILES): 3.7 **VCU:** 439

FUNCTIONAL CLASS: Local

DESIGN SPEED: 10 **WIDTH:** 14 **SERVICE LIFE:** L1

DESIGN VEHICLE: **CRITICAL VEHICLE:** LOWBOY

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT:** NO

MAINTENANCE LEVELS: _ **ACTIVE SALE:** 2 **POST SALE:** 1

INTENDED PURPOSE:
This road would provide access to Units 28, 24, 21, 20, 19, 16, and 6 in the northwestern part of the project area.

FUTURE NEEDS:
This road would provide access to unharvested CFL between Unit 6 and Unit 28. This road could be extended to provide access to the remaining CFL in the northwestern portion of the project area.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel. Accept Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS

WATERSHED/FISHERY:
A major area of concern is the crossing at the Duncan Creek, a Class 1 stream. However, a passage barrier currently exists about 2.1 miles from the stream mouth. Consequently, prohibit road construction between August 15 and May 15 for Class I and II streams, to minimize sedimentation during egg incubation periods only if adjustments are

made to allow passage of anadromous fish prior to road construction. Implement BMP'S 14.1, 14.5, 14.6, 14.9, 14.13, 14.14, 14.15, 14.16, 14.17, 14.19).

From MP 2.11 to 2.19, the road segment contains steep sustained road grades and crosses severely incised V notched streams. Prevent siltation of downstream Class I steam with wider than normal ditching and more frequent placement of cross ditching structures.

WILDLIFE BIODIVERSITY:
This road would provide access to previously unfragmented old growth forest located adjacent to Salt Chuck Wilderness. These stands provides important habitat for Sitka black tailed deer, marten, marbled murrelets and other wildlife species.

VISUAL RESOURCE:
Road segment between MP 3.04 TO MP 3.08 has average side hill slopes of over 65 percent (critical area I). To mitigate visual impact from Duncan Canal, this section will require end hauling. Spoilage material could be used as fills for landings in Units 6 and 16.

ROCK BORROW SITES:
During the field verification stages of the access route, no potential rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.450	580	I	6X25	Rock 90 Ft. Bridge	20
1.090	3956	III	3X5 Gravel	72"	15
1.147	10900	III	2X3 Gravel	48"	20
1.166	10800	III	2X3 Gravel	48"	15
1.280	10200	III	2X3 Gravel	60"	15
1.431	9400	II	2X3 Gravel	48"	15
1.526	8900	III	4X6.2 Gravel	84"	20
1.545	8800	III	3X5 Gravel	72"	15
1.583	8600	III	2X3 Gravel	48"	20
1.640	8300	III	1X5 Gravel	72"	20
1.678	8100	III	1X2 Gravel	2 X 36"	
1.812	7391	III	2X3 Gravel	48"	15
1.933	6751	III	40X15	60"	25
1.967	6571	III	25X20	Rock 55 Ft. Bridge	20
2.106	5836	III	2X3 Gravel	2x48"	15
3.060	801	III	2X3 Gravel	48"	20

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES:

ROAD NUMBER: 43501 **ROAD NAME:** Pintail NEPA: ____ **MAP:** 1

TERMINI: MP 1.1 Road 43500 - End

LENGTH (MILES): 1.1 **VCU:** 439

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft):** 14 **SERVICE LIFE:** Ll

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE:** Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT:** No

MAINTENANCE LEVELS: _ **ACTIVE SALE:** 2 **POST SALE:** 1

INTENDED PURPOSE:
This road would provide cable access logging to Units 35 and 32 and helicopter logging access to Units 31 and 34.

FUTURE NEEDS:
Extension of this road would be required to access the remaining CFL to the east of Unit 32.

TRAVEL WAY MANAGEMENT PRESCRIPTION:

This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel. Accept Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
From MP 0.00 to 1.04 and specifically at MP 0.21, 0.34 and MP 1.02 segment of road crosses Class III streams directly upstream Class I habitat.

WILDLIFE BIODIVERSITY:
Road would be located in currently unfragmented old growth, in important deer and marten winter habitat.

ROCK BORROW SITES:
During the field verification stages of the access route, no possible rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Gradient In %
0.208	1100	III	3X5 Gravel	72"	15
0.341	1800	III	2X4.5	Gravel 60"	20
0.471	486	III	2X3	Gravel 48"	15
0.678	1581	III	2X3	Gravel 48"	15
0.788	2160	III	2X3	Gravel 48"	20
1.022	3397	III	2X4.5	Gravel 60"	20

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43503 **ROAD NAME**: Magpie **NEPA**: ____ **MAP**: 1

TERMINI: MP 2.65 Road 43500 - M.P. 0.4

LENGTH (MILES): 0.4 **VCU**: 439

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: LI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVELS:_ **ACTIVE SALE**: 2 **POST SALE**: 1

INTENDED PURPOSE:
The proposed section of Road 43500 accessing Unit 16 has a steep road grade. Road 43503 is intended to assist in logging of this unit by yarding logs to this road.

FUTURE NEEDS:
Extension of this road would be required to access all the CFL below possible future extension of Road Number 43500.

TRAVEL MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY RESOURCE:
This road crosses Class III streams at MP 0.02, 0.05, 0.17, 0.21, directly upstream of Class I habitat. However, a natural passage barrier currently exists downstream of these locations and construction related impacts are dampened further by the presence of beaver ponds. No timing restrictions are required.

WILDLIFE AND BIODIVERSITY:
Road is located through area of old growth timber of high value deer winter habitat.

ROCK BORROW SITES:
During the field verification stages of the access route, no potential rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.02	100	III	2X3 Gravel	48"	15
0.05	250	III	2X3 Gravel	48"	15
0.17	900	III	2X3 Gravel	48"	20
0.21	1100	III	2X3 Gravel	48"	20

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43504 **ROAD NAME**: Kittiwake **NEPA**: ___ **MAP**: 1

TERMINI: MP 3.7 Road 43500 - MP 1.0

LENGTH (MILES): 0.6 **VCU**: 439

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: SI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVELS: _ **ACTIVE SALE**: 2 **POST SALE**: Storage

INTENDED PURPOSE:
The intent of this road is to access Unit 2.

FUTURE NEEDS:
This road could be extended another half mile to access the remaining CFL. This road is not expected to be extended within the next 10 years.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

All motorized vehicle use is eliminated after commercial use is completed. This is accomplished by blocking access and removing all culverts and bridges. The roadway will be seeded to grass and fertilized.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	N/A
Discourage	N/A
Prohibit	Public traffic during commercial use.
Eliminate	All motorized access after commercial use.

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
At MP 0.04, dc not incorporate woody or vegetative material into the v-notch crossing.

WILDLIFE/BIODIVERSITY:
Road segment is adjacent to proposed small Wildlife Retention Area for VCU 439 and near Duncan Creek Salt Chuck Wilderness.

A blue heron nest is located 1/8 mile from the proposed road. If the blue heron nest is active at the time of operations, prohibit road construction activities from March 1 to July 31.

SOILS/VISUAL RESOURCE:
The road segment between MP 0.038 and 0.039 has sidelopes exceeding 65 percent (critical area 4). Require end-hauling to mitigate both soil stability and visual concerns. The road cut would be visible from Duncan Canal. Spoilage material could be used as fills for landings in Units 2 and 6.

ROCK BORROW SITES:
During the field verification stages of the access route, no potential rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.038	203	III	4X7 Gravel	30' log stringer bridge	15

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43506 **ROAD NAME:** Puffin **NEPA:** ____ **MAP:** 1

TERMINI: MP 11.34 Road 6350 - MP 1.6

LENGTH (MILES): 1.6 **VCU:** 439

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft):** 14 **SERVICE LIFE:** Sl

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE:** Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT:** No

MAINTENANCE LEVELS: _ **ACTIVE SALE:** 2 **POST SALE:** Storage

INTENDED PURPOSE:
This road is intended to provide cable access logging for Unit 39 and helicopter access logging to Unit 41.

FUTURE NEEDS:
This road would provide access to remaining CFL north of Unit 39, but is not expected to be extended within the next decade.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

All motorized vehicle use is eliminated after commercial use is completed. This is accomplished by blocking access and removing all culverts and bridges. The roadway will be seeded to grass and fertilized.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	N/A
Discourage	N/A
Prohibit	Public traffic during commercial use.
Eliminate	All motorized traffic after commercial use.

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
Wide creek crossings are located at MP 0.55, 0.91 and MP 1.04. These crossings would require special on site supervision during road construction phase to maintain water quality (BMP's 14.5, 14.9, 14.14, 14.17, 14.22). Control scouring at culverts outlet with energy dissipators.

From the beginning of construction to MP 1.48, this road would cross 12 Class III streams directly upstream of Class I habitat. However, a passage barrier currently exists downstream of these streams.

ROCK BORROW SITES:
During the field verification stages of the access route, no potential rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.095	500	III	2x3 Gravel	48"	30
0.284	1500	III	2x3 Gravel	48"	30
0.398	2100	III	2x3 Gravel	48"	25
0.417	2200	III	2x3 Gravel	48"	25
0.511	2700	III	2x3 Gravel	48"	25
0.549	2900	III	4x7 Gravel	log stringer bridge	35
0.871	4600	III	2x3 Gravel	48"	30
0.909	4800	III	2x4.5 Gravel	log stringer bridge	30
1.042	5500	III	2x4.5 Gravel	log stringer bridge	25
1.288	6800	III	2x3 Gravel	48"	25
1.383	7300	III	2x3 Gravel	48"	30
1.477	7800	III	2x3 Gravel	48"	25

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43518/6355 **ROAD NAME**: Dowitcher **NEPA**: ____ **MAP**: 5

TERMINI: MP 4.13 Road 6352 - MP 2.7

LENGTH (MILES): 2.7 **VCU**: 437/448

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: LI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Lowboy

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVEL: __ **ACTIVE SALE**: 2 **POST SALE**: 1

INTENDED PURPOSE:
This road is intended to access CFL in the southeastern sections of the project area in conjunction with Road 6355. This road would provide the main access for most of the harvest units in the southeastern part of the project area.

FUTURE NEEDS:
This road could be extended to access the remaining CFL to the south of Unit 136, as well as the unharvested areas between Units 133, 134 and 136.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may take ten to fifteen years.

Maintenance Level. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
This road crosses Colorado Creek, a Class II stream, at MP 1.242 (BMP'S 14.1, 14.5, 14.9, 14.14, 14.17, 14.19).

Control scouring at culverts outlet with energy dissipators. Reduce amount of soil disturbances in stream crossings by the temporary use of crossing logs before the final installation of cross drainage structures

WILDLIFE:
Between MP 1.37 to 2.7, this area has been identified as important marbled murrelet nesting area and the road is located within the proposed northern WRA at the southern end of the project area. This road also bisects important deer winter habitat and high value marten habitat. Minimize road construction activities from April 15 to September 15 to partially mitigate impacts to wildlife.

ROCK BORROW SITES:
During the field verification stages of the access route, no possible rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.544	2872	II	1X1, Gravel	24"	
0.570	3007	II	1X2, Gravel	36"	
0.602	3178	II	1X1, Gravel	24"	
0.642	3389	II	1X2, Gravel	36"	15
1.242	6557	II	29x25	70 Ft. Bridge	
2.087	1455	III		48"	
2.107	11535	III	1X2, Gravel	2X36"	25
2.167	1855	III		60"	
2.411	3140	III	4X7, Gravel	70 Ft. Bridge	
2.541	475	III	1X1, Gravel	2x24"	
2.625	920	III	4X7, Gravel	84"	25
2.701	1320	III	1X1, Gravel	2x24"	

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43520 Section B **ROAD NAME**: Junco **NEPA**: ___ **MAP**: 4

TERMINI: MP 1.55 Road 6350 - MP 1.57

LENGTH (MILES): 1.6 **VCU**: 437/447

FUNCTIONAL CLASS: Collector

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: LC

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Lowboy

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVELS: __ **ACTIVE SALE**: 2 **POST SALE**: 1

INTENDED PURPOSE:
This road segment provides direct yarding access to Unit 142 and road access to Roads 43521 and 43523 and to the local road segment of Road 43520.

FUTURE NEEDS:
This portion of road would be needed to haul logs from those areas not currently proposed for harvest along Roads 43521 and 43523 and the local road segment of Road 43520.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
From MP 1.06 to 1.58, reduce the amount of soil disturbances in stream crossings through the temporary use of crossing logs before the final installation of cross drainage structures.

SOILS:
Between MP 0.10 to MP 0.24, The average side hill slope is 65 percent on rocky material (critical area 3). This section would require end hauling with the spoilage material used as ballasting material. Any of identified rock borrow sites on this road could be used for excessive end haul materials.

ROCK BORROW SITES:
Potential rock quarries located at MP 0.24, 0.28, 0.32, 1.76, 2.04, 2.87 and 2.98

STREAM CROSSINGS: NONE

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43520 Section A **ROAD NAME**: Junco **NEPA**: ___ **MAP**: 3 and 4

TERMINI: MP 1.57 - MP 9.2

LENGTH (MILES): 7.63 **VCU**: 437/447

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: LI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Lowboy

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVELS: _ **ACTIVE SALE**: 2 **POST SALE**: 1

INTENDED PURPOSE:
The purpose of this road is to provide access to cable logging for Units 90, 93, 97, 85, 98, and 45. This road also accesses helicopter Units 94, 104, and 97.

FUTURE NEEDS:
This road could be extended to access the remaining CFL to the north of Unit 90 to the National Forest property boundary. This road could potentially link with Road 6350 at the headwaters of Duncan Creek.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and constructing a tank-trap.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Highway vehicles.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
There is one proposed crossing of a Class I stream on this road located at MP 7.80. This bridge crossing will require the following BMP'S 14.1, 14.5, 14.6, 14.9, 14.13, 14.14, 14.15, 14.16, 14.17, 14.19). Prohibit road

construction activities between August 15 to May 15 at the above creek crossing to prevent potential sedimentation during egg incubation periods.

This road also crosses Class II creeks at MP 5.78, 6.44, 6.52, 6.54, 6.69, 7.14, 7.16, 7.2. Prohibit road construction activities between August 15 to May 15 at the above creek crossings to prevent potential sedimentation during egg incubation periods.

From MP 1.58 to 7.80, control scouring at culverts outlet with energy dissipators. Reduce amount of soil disturbances in stream crossings through the temporary use of crossing logs before the final installation of cross drainage structures.

WILDLIFE:
From MP 1.58 to 2.37, This road segment bisects important deer winter habitat.

From MP 2.37 to 5.14, this road segment is located near an active goshawk nest. If nest is active, prohibit road construction activities from March 15 to August 15 to mitigate impacts to nesting and fledging goshawks.

From MP 5.34 to 5.78, this road segment is located within important deer winter habitat and high value marten habitat. Minimize road construction activities from March 15 to August 15 to partially mitigate impacts to wildlife.

From MP 5.78 to 9.2, this road segment is located within proposed small WRA for VCU 447. This road is within important marbled murrelet nesting area and high value marten habitat. Minimize road construction activities from April 15 to September 15 to partially mitigate impacts to wildlife.

VISUAL RESOURCE:
Field identified rock borrow sites at MP 2.04, 2.87, 2.98 are visible from the Wrangell Narrows. Recommend that if any one of these rock borrow sites is required during the road construction phase, coordinate with the Landscape Architect to develop screening effects that would meet VQO of Partial Retention or Retention.

SOIL:
Between MP 2.56 to MP 2.69, the average side hill slope is 60 percent with numerous small creeks and seepage areas (critical area 2). This section will require end hauling and/or geo-textile fabric during road construction.

ROCK BORROW SITES:
Potential rock quarries are located at MP 0.24, 0.28, 0.32, 1.76, 2.04, 2.87 and 2.98.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
1.601	2883	II	2x3, Gravel	48"	20
1.996	947	III	2x3, Gravel	48"	25
2.227	2165	II	1x2, Gravel	36"	20
2.523	10349	III	2x3, Gravel	48"	30
4.915	300	III	1x1, Gravel	2x24"	
5.077	3800	II	44x32	60 Ft. Bridge	30
5.096	3700	II	1x2, Gravel	36"	25
5.323	2500	II	3x5, Gravel	72"	25
5.361	2300	II	2x4.5, Gravel	60"	35
5.437	1900	II	2x4.5, Gravel	60"	30
5.531	1400	II	2x3, Gravel	48", 36"	20
5.550	1300	II	2x3, Gravel	48", 24"	20
5.569	1200	II	2x3, Gravel	48",36"	25
5.607	1000	III	1x1, Gravel	2x 24"	
5.780	90	II	44x32	144"	20
6.422	3300	III	2x3, Gravel	48"	20
6.441	3400	II	3x5, Gravel	72"	30
6.516	3800	II	3x5, Gravel	96"	30
6.535	3900	II	3x5, Gravel	72"	25
6.611	4300	III	2x3, Gravel	48"	20
6.668	4600	III	2x3, Gravel	48"	20
6.687	4700	II	4x7, Gravel	84"	25
6.696	4750	III	2x3, Gravel	48"	20
6.971	6200	III	2x3, Gravel	48"	25
6.990	6300	III	2x3, Gravel	48"	30
7.066	6700	III	3x5, Gravel	72"	35
7.084	6800	III	2x4.5, Gravel	60"	25
7.103	6900	III	2x3, Gravel	48"	25
7.141	7100	II	4x7, Gravel	96"	30
7.160	7200	II	2x3, Gravel	48"	25
7.198	7400	II	4x7, Gravel	72"	35
7.388	400	III	2x3, Gravel	48"	20
7.736	2240	III	2x3, Gravel	48"	20
7.784	2495	III	2x3, Gravel	48"	20
7.797	0	I	80x45	144"	10
8.346	2900	III	3x5, Gravel	72"	35
8.422	3300	III	2x3, Gravel	48"	20

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43521 **ROAD NAME:** Albatross **NEPA:**___ **MAP:** 4

TERMINI: MP 1.06 Road 43520 - End

LENGTH (MILES): 1.3 **VCU:** 447

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft):** 14 **SERVICE LIFE:** LI

DESIGN VEHICLE: Log Truck **CRITICAL VEHICLE:** Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT:** No

MAINTENANCE LEVELS:_ **ACTIVE SALE:** 2 **POST SALE:** 1

INTENDED PURPOSE:
The purpose of this road is to access Units 106 and 107.

FUTURE NEEDS:
CFL between Units 106 and 107.

TRAVELWAY MANAGEMENT PRESCRIPTION

This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close by alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS

WILDLIFE/BIODIVERSITY

From MP 0.00 to MP 1.3, this road segment is located within important deer winter habitat and high value marten habitat.

ROCK BORROW SITES:

During the field verification stages of the access route, no potential rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits would be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class III	Max Creek Size	Approximate Culvert Bridge Size	Creek Gradient in %
0.534	2820	2x3, Gravel	48"	15	

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43523 **ROAD NAME:** Ruff **NEPA:** ____ **MAP:** 4

TERMINI: MP 1.24 Road 43520 - End

LENGTH (MILES): 0.8 **VCU:** 437

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft):** 14 **SERVICE LIFE:** LI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE:** Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT:** No

MAINTENANCE LEVELS: _ **ACTIVE SALE:** 2 **POST SALE:** 1

INTENDED PURPOSE:
This road would provide access to cable log Unit 66 and helicopter log Unit 65.

FUTURE NEEDS:
This road could be extended to provide access to CFL south of Units 65 and 66.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
This road crosses Class II creeks at MP 0.07 and 0.22 and crosses Class III creeks at 0.43, 0.58, 0.67. Prohibit road construction between August 15 and May 15 to minimize sedimentation during egg incubation periods on the Class II streams. Riprap culverts inlets and outlets to reduce sedimentation (BMP'S 14.1, 14.5, 14.6, 14.9, 14.13, 14.14, 14.15, 14.16, 14.17, 14.19).

WILDLIFE RESOURCES:
From MP 0.00 to 1.0, this road segment is located within important deer winter habitat and high value marten habitat. Minimize impacts to subsistence use of the deer herd.

ROCK BORROW SITES:
Possible rock quarry is located at MP 0.72

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max.Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.065	3996	II	3X5, Gravel	72"	30
0.222	3171	II	49x33	144"	25
0.430	2069	III	8.5X9, Rock	96"	35
0.584	1256	III	2X3, Gravel	48"	20
0.673	786	III	3X5, Gravel	72"	30

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 43527 **ROAD NAME**: Bobolink **NEPA**: ___ **MAP**: 3

TERMINI: MP 0.88 Road 6354 - MP 1.26

LENGTH (MILES): 1.26 **VCU**: 437

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: LI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVELS: _ **ACTIVE SALE**: 2 **POST SALE**: 1

INTENDED PURPOSE:
This road would provide access to cable log Units 55 and 56M.

FUTURE NEEDS:
An extension of this road would be required to access the remaining CFL southwest of Unit 55. This road could be used to provide access to unharvested CFL between Units 55 and 56M, but is not expected to be needed within the next decade.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log hauling and rock hauling to avoid safety problems because the road is not designed for mixed traffic.

All motorized vehicle use is eliminated after commercial use is completed. This is accomplished by blocking access and removing all culverts and bridges. The roadway will be seeded to grass and fertilized.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	N/A
Discourage	N/A
Prohibit	Public traffic during commercial use.
Eliminate	All motorized traffic after commercial use.

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
This road crosses Class II creek at MP 0.93, and crosses Class III creeks at 0.78, and 1.25. However, these culverts are relatively far from Class I stream habitat. Consequently, no timing restrictions are required. Riprap culverts inlets and outlets to reduce sedimentation (BMP'S 14.1, 14.5, 14.6, 14.9, 14.13, 14.14, 14.15, 14.16, 14.17, 14.19).

WILDLIFE:
From MP 0.00 to 1.30, road segment passes along the northern edge of WRA planned for VCU 437 and also lies within the post fledging area for active goshawk nest.

ROCK BORROW SITES:
Existing rock quarry is located at MP 0.00.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max. Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.783	1180	III	1X1, Gravel	2X24"	
0.931	1960	II	3X5, Gravel	72"	
1.245	3620	III	4X7, Rock	36", 96"	30

PLANNED ROAD DESCRIPTIONS

ROAD MANAGEMENT OBJECTIVES

ROAD NUMBER: 6355 **ROAD NAME**: Wrangell Narrows **NEPA**: ___ **MAP**: 4 and 5

TERMINI: End of Existing Road 6355 - To Unit 129

LENGTH (MILES): 1.96 **VCU**: 447/448

FUNCTIONAL CLASS: Local

DESIGN SPEED (MPH): 10 **WIDTH(ft)**: 14 **SERVICE LIFE**: LI

DESIGN VEHICLE: Log-Truck **CRITICAL VEHICLE**: Yarder

TRAFFIC SERVICE LEVEL: D **HIGHWAY SAFETY ACT**: No

MAINTENANCE LEVELS: _ **ACTIVE SALE**: 2 **POST SALE**: 1

INTENDED PURPOSE:
This road would provide the main access for some of the harvest units in the southeastern part of the project area.

FUTURE NEEDS:
This road system could be extended another mile south to access the remaining CFL south of Unit 129.

TRAVELWAY MANAGEMENT PRESCRIPTION:
This road is designed for high clearance vehicles, requiring special driver skills, such as pickup trucks. This road is a single lane with some turnouts, backing to allow vehicles to pass is expected. Safety features for mixed traffic are not designed. It will be common for low clearance vehicles to drag bottom from time to time. The objective is to provide a facility safe for this type of use but without a high maintenance level.

Public use is prohibited during commercial use, such as yarding, log haul and rock haul to avoid safety problems because the road is not designed for mixed traffic.

Public use with highway vehicles is discouraged after the commercial use is completed. This is accomplished by relying on advisory signs and by using trees and brush to camouflage the road entrance and by allowing alder to eventually close the road. This strategy to allow road to close (inactive status) by alder growth may take ten to fifteen years.

Maintenance Level 1. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

TRAVEL MANAGEMENT STRATEGY:

Encourage	Bicycles, hikers and all other non-motorized modes of travel.
Accept	Off-highway vehicles.
Discourage	Highway vehicle use after commercial uses.
Prohibit	Public traffic during commercial use.
Eliminate	N/A

RESOURCE CONSIDERATIONS AND MITIGATIONS:

WATERSHED/FISHERY:
There are V-notch crossings at MP 0.46, 0.53, 1.08, 1.29, 1.10, 1.29, 1.48 and MP 1.70; all of these creeks are Class III streams. There is one Class II stream at MP 0.03 (BMP's 14.5, 14.8, 14.10, 14.14, 14.19). The nose of the converging channels on Class III creeks are unstable and the culverts may focus the stream flow thus promoting incision. The outflow of the culverts will require energy dissipators.

Crossings on Class III streams at MP 1.08, 1.1, 1.3, 1.5, and 1.7 are relatively large and are within 0.25 mi of Class I streams within the Colorado Creek drainage, an important coho producing stream. Prohibit road construction between August 15 and May 15 to minimize sedimentation during egg incubation periods at these crossings.

WILDLIFE/BIODIVERSITY:
Road is proposed to be located within important deer winter habitat and high value marten habitat. This road would enter the proposed Medium Wildlife Retention Area (MWRA). Minimize road construction between May 15 and September 1 from MP 0.53 to 1.12 to partially mitigate impacts to marbled murrelet nesting area and other wildlife concerns.

SOILS:
The nose of the converging channels cited under "Watershed/Fishery" is unstable and culverts may focus the stream flow and thus promoting incision. Control scouring at culvert inlets and outlets with energy dissipators such as rocks.

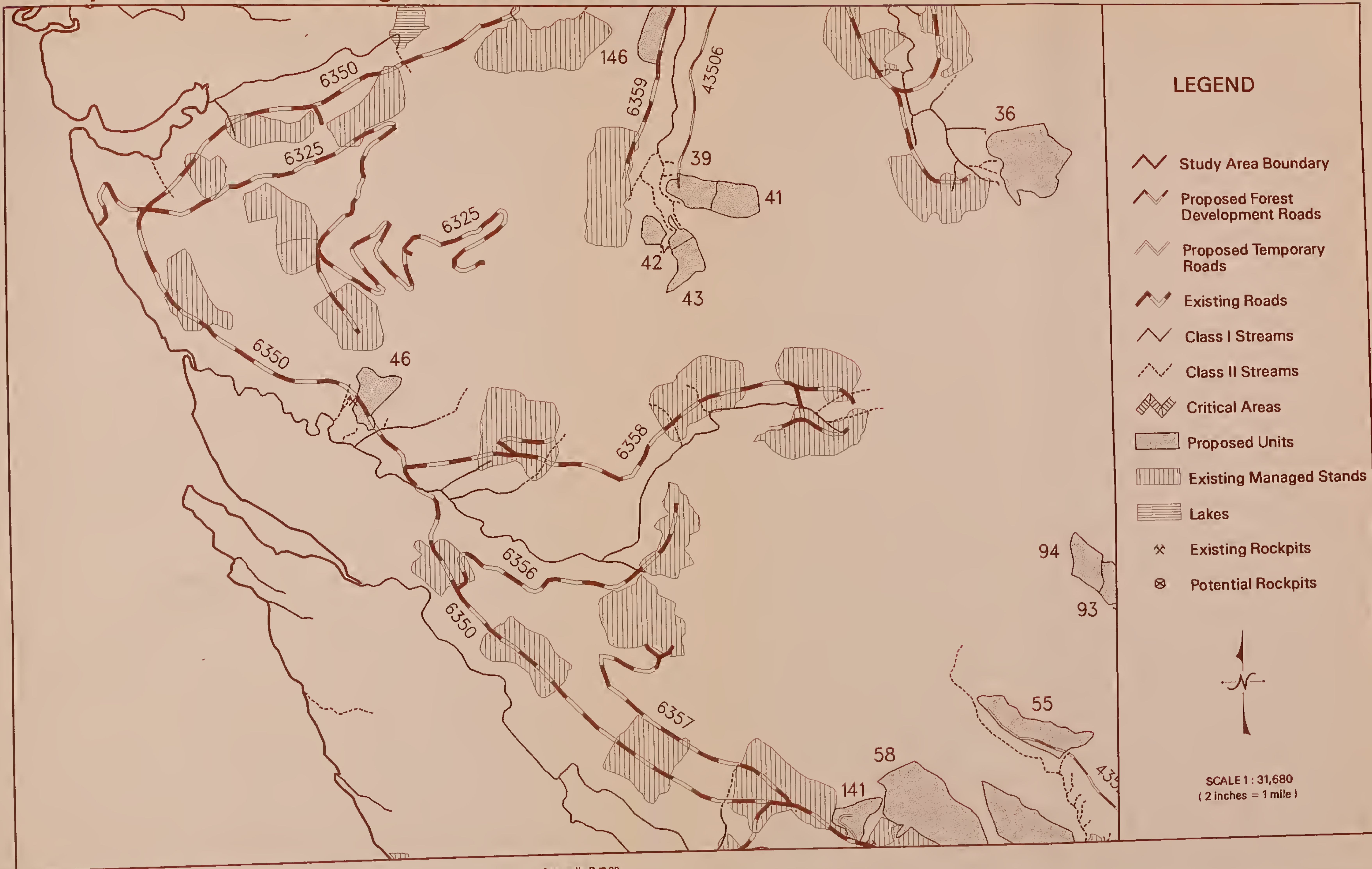
ROCK BORROW SITES:
During the field verification stages of the access route, no potential rock pit sites were found. The area along the access route consists of two to three feet of organic matter underlined by rocks. Possible sites for rock pits will be identified during the finalization of the road access and/or during the actual road construction phase.

STREAM CROSSINGS:

Mile Post	Field Station	Stream Class	Max.Creek Size	Approximate Culvert Bridge Size	Creek Gradient In %
0.032	168	II	2X3, Gravel	48"	10
0.271	822	III	2X3, Gravel	48"	20
0.293	939	III	2X3, Gravel	48"	25
0.456	1800	III	2X3, Gravel	48"	25
0.532	2200	III	2X3, Gravel	48"	20
1.056	145	III	1X1, Gravel	2X24"	
1.076	248	III	2X4.5, Gravel	60"	30
1.102	388	III	4X7, Gravel	96"	35
1.286	1360	III	3X5, Gravel	72"	25
1.478	940	III	3x5, Gravel	72"	25
1.690	2060	III	1X5, Gravel	72"	20

Proposed South Lindenberg Roads and Harvest Units

Proposed South Lindenberg Roads and Harvest Units



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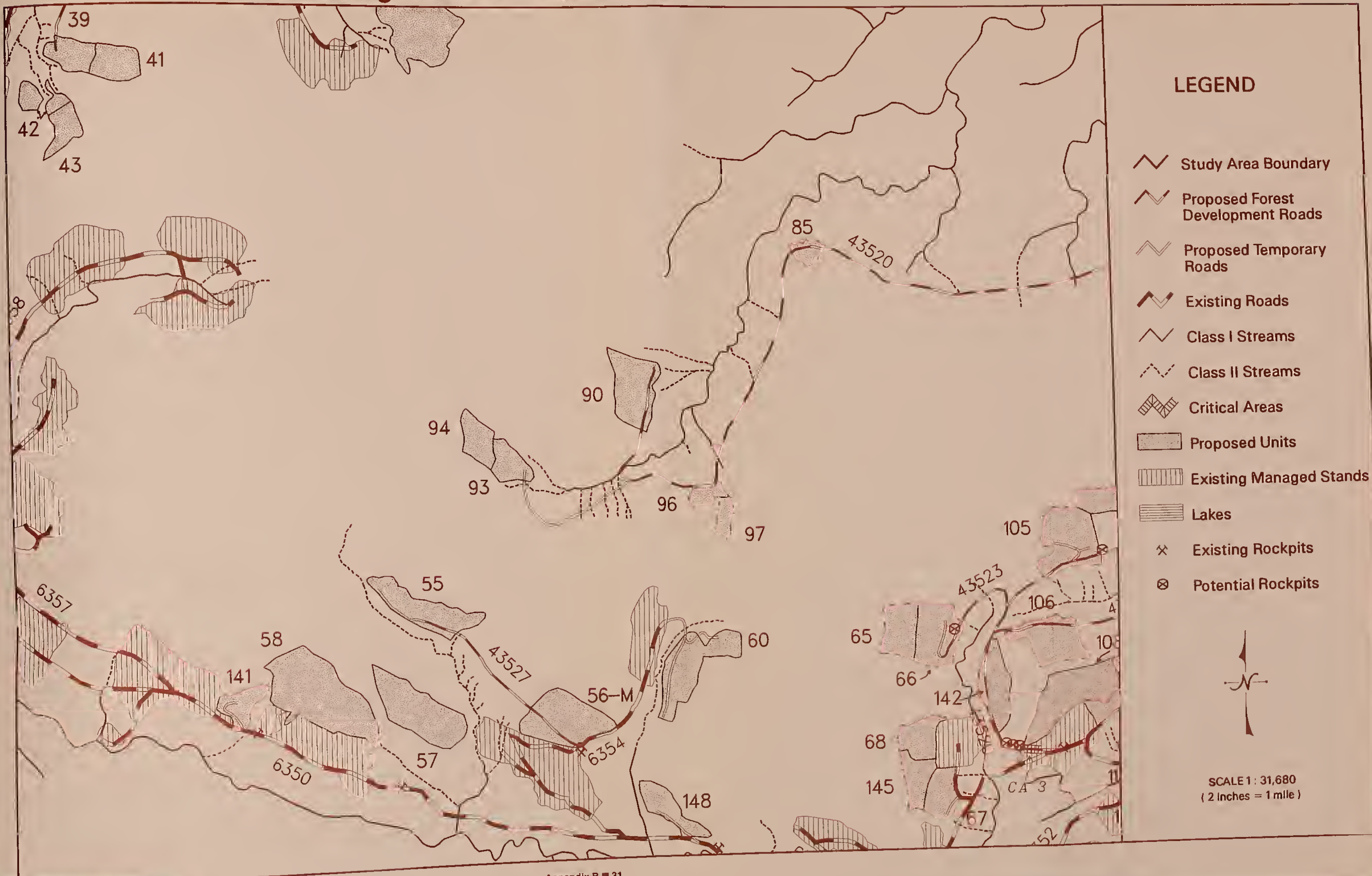

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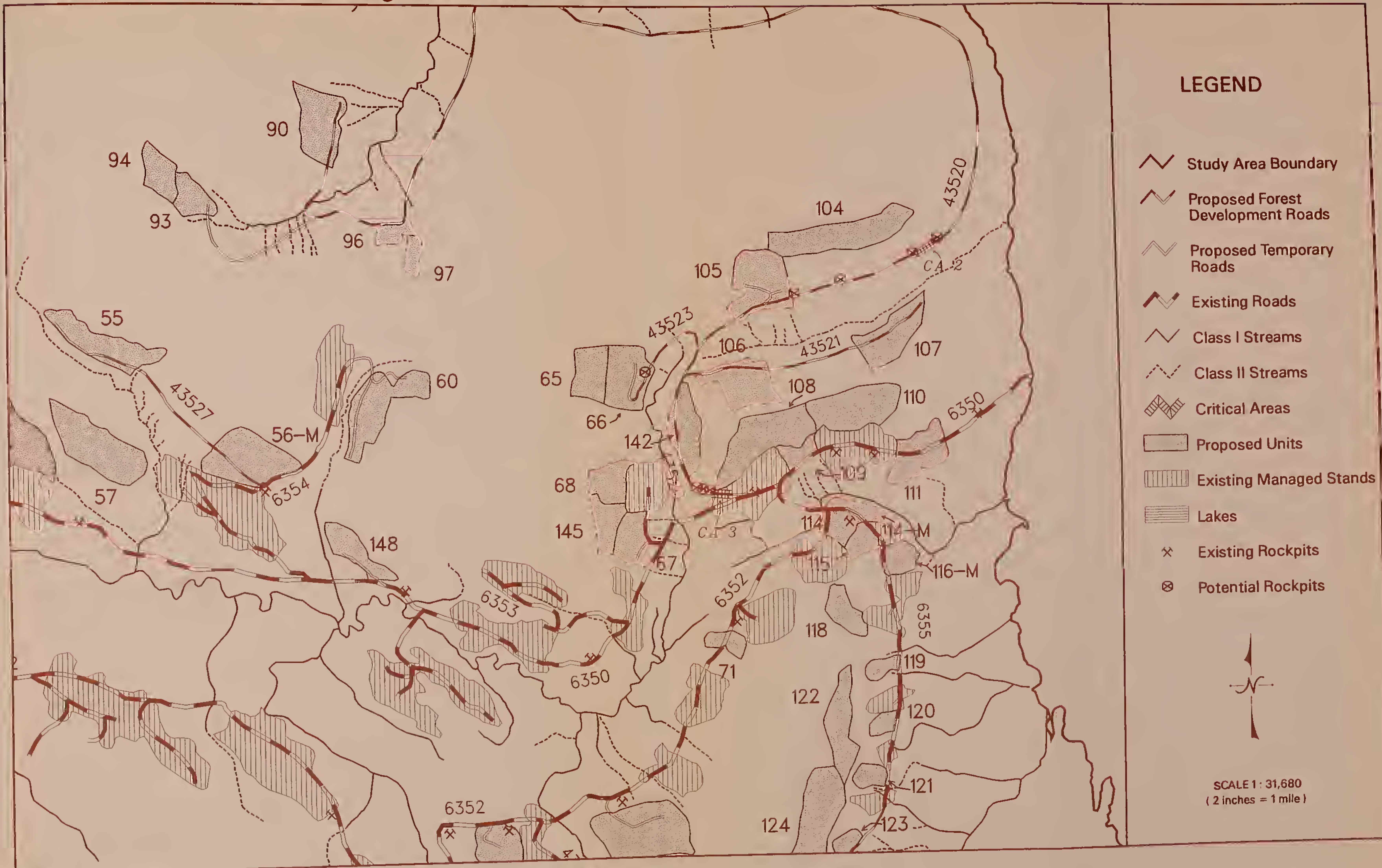

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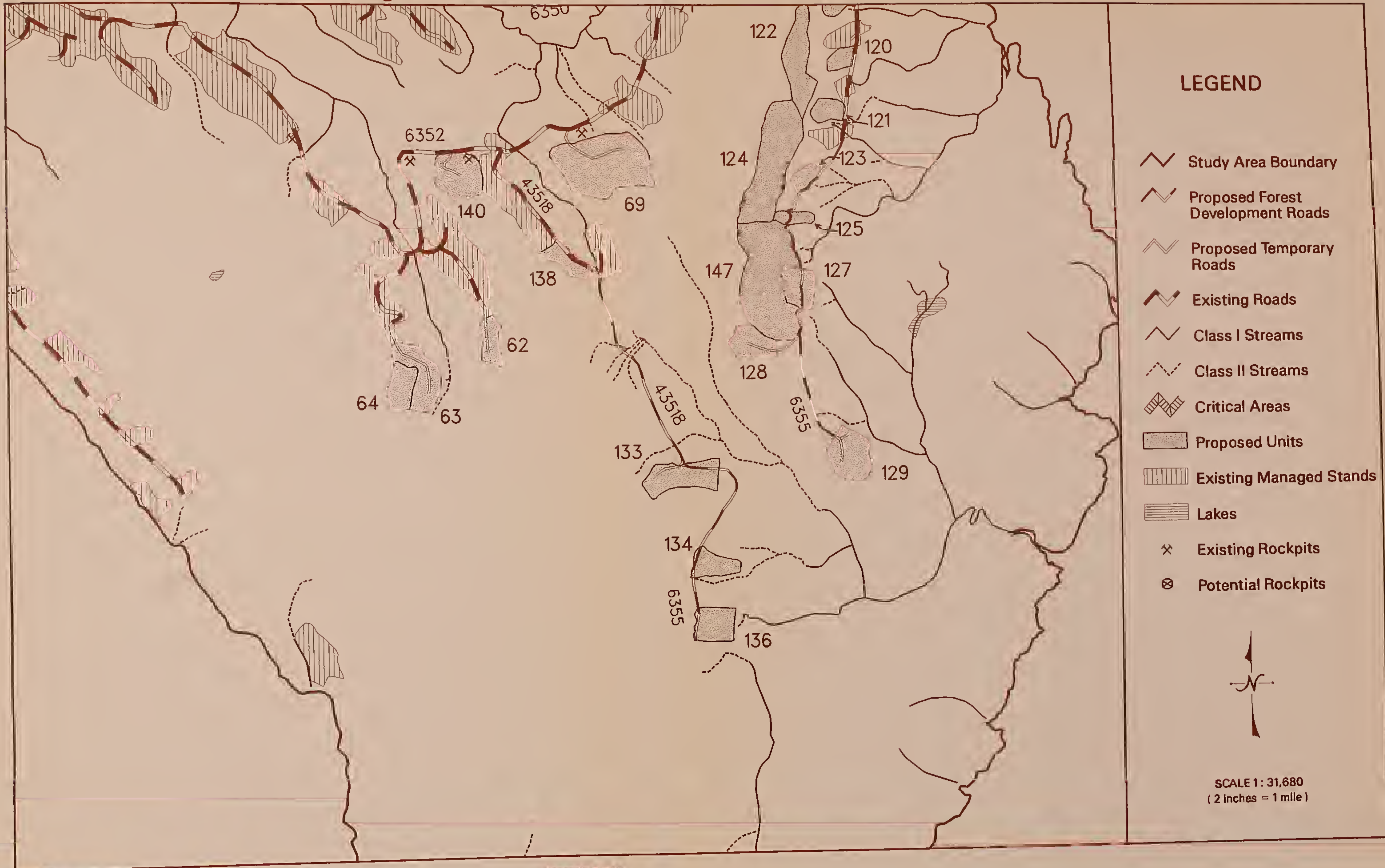

Appendix C

Additional Monitoring References

APPENDIX C

ADDITIONAL MONITORING REFERENCES

Included in this appendix are two monitoring forms, one each for timber harvest and road management activities. These forms are intended for use in effectiveness monitoring of soil and water Best Management Practices (BMPs) found in Chapter 2.

BMP IMPLEMENTATION MONITORING FORM: TIMBER MANAGEMENT PRACTICES

Date:_______ Sale Name: _________ Unit #:____ 1/4 Quad: _____ VCU: ____ Road # ______
Monitored by: ___________ Aerial Photo: Yr. __ Flt:___ Photo#: _____
Stream Name: __________ Channel Type: ____ ADF&G#: ______ NFS Watershed #: ________
Unit Release Date: _______ Harvest Date: ________ Acceptance Date: _________
Management Objectives: CS __ PSP __ ST __ WQ __ FP __ LWD __ TI0

Phase Problem Occurred in:

BMP NUMBERS*	RATING	SE	EA	CT	LO	AD	COMMENTS
Unit Layout & Design 13.2 Timber Harvest Unit Design							
13.5 Protection of Unstable Areas							
13.10 Log Landing Location & Design							
Riparian Area Management 12.6 Riparian Area Designation & Protection							
Timber Harvesting 13.7 Determining Suitability for Shovel Logging							
Erosion Control 13.11 Erosion Prevention and Control							
13.14 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure							
Hazardous Materials 12.8 Oil Pollution Prevention and Servicing/ Refueling Operations							
Maintenance 14.20 Road Maintenance							

* Only high priority BMP's are listed. Site specific concerns may be addressed by adding appropriate BMP's on back of this form.

1/4 Quad: List of USGS 1/4 Quadrangle that Unit can be located on.

Stream Name: Indicate formal USGS name, that the stream is a tributary to a formally named stream (Tributary to ________). or that this item is not applicable (NA). Stream must be associated to unit or within 200 feet of unit.

Acceptance Date: Date Forest Service accepted the road as being complete and agreed that the contractor met the obligations of the contract.

Unit Release Date: Date when the unit was released for harvest.

Harvest Completion Date: Date when yarding was completed.

Unit Card Objectives: Principal issues defined by unit card and fish habitat report. Key to abbreviations are as follows:

CS=Channel Stability
ST=Stream Temperature
FP= Fish Passage
TI0=Time of Instream Operations
PSP=Primary/Secondary Productivity
WQ= Water Quality Maintenance
LWD=Large Woody Debris Source

Implementation Rating

4 = Operation Exceeds BMP Requirements
3 = Operation Meets BMP Requirements (90% -100% of Project Area Meets BMP)
2 = Minor Departure from BMP (75%-89% of Project Area Meets BMP)
1 = Major Departure from BMP (less than 75% of Project Meets BMP)
0 = BMP Disregarded (Total Disregard of BMP's throughout Project Area)
NC= BMP not complete at time of survey

Phase in Which Problems Occurred

SE = Site Evaluation Phase
EA = Environmental Analysis (EIS)
CT = Long Term Contract or Individual Sale Contract
LO = Unit Layout Phase
AD = Sale Administration Phase

Comments

As a suggestion, comments may include:
- The number of acres of unstable area disturbed by management activities
- Implementation of site specific prescriptions

Additional BMP's of Concern

		Phase Problem Occurred in:					
BMP NUMBERS*	RATING	SE	EA	CT	LO	AD	COMMENTS

BMP IMPLEMENTATION MONITORING FORM: ROAD AND TRANSPORTATION FACILITIES

Date:_______ Sale Name: _________ Unit #:____ 1/4 Quad: _____ VCU: ____ Road # ______
Monitored by: ___________ Aerial Photo: Yr. __ Flt:___ Photo#: _____
Stream Name: __________ Channel Type: ____ ADF&G#: ______ NFS Watershed #: ________
Unit Release Date: ________ Harvest Date: ________ Acceptance Date: __________
Management Objectives: CS __ PSP __ ST __ WQ __ FP __ LWD __ TI0

		Phase Problem Occurred in:					
BMP NUMBERS*	RATING	SE	EA	CT	LO	AD	COMMENTS
Riparian Area Management 12.7 Streambank Protection							
14.13 Control of Const. in Riparian							
14.14 Control of In-Channel Operations							
14.15 Diversion of Flows Around Construction Sites							
14.16 Stream X-ings on Temp. Roads							
14.17 Bridge & Culvert Installation							
Location and Design 14.2 Location of Transportation Facilities							
14.3 Design of Transportation Facilities							
14.4 Location and Design of Log Transfer Facilities							
Erosion Control 14.5 Road & Trail Erosion Control Plan							
14.7 Slope Stabilization to Minimize Mass Failure							
14.8 Slope Stabilization to Minimize Surface Erosion							
14.12 Control of Excavation and Sidecast Materials							
14.25 Obliteration of Temp. Roads							
Drainage 14.9 Control of Road Drainage							
Hazardous Materials 12.8 Oil Pollution Prevention and Servicing/Refueling Operations							
Maintenance 14.20 Road Maintenance							

* Only high priority BMP's are listed. Site specific concerns may be addressed by adding appropriate BMP's on back of this form.

1/4 Quad: List of USGS 1/4 Quadrangle that Unit can be located on.

Stream Name: Indicate formal USGS name, that the stream is a tributary to a formally named stream (Tributary to ________). or that this item is not applicable (NA). Stream must be associated to unit or within 200 feet of unit.

Acceptance Date: Date Forest Service accepted the road as being complete and agreed that the contractor met the obligations of the contract.

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4 = Operation Exceeds BMP Requirements
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2 = Minor Departure from BMP (75%-89% of Project Area Meets BMP)
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Phase in Which Problems Occurred

SE = Site Evaluation Phase
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LO = Unit Layout Phase
AD = Sale Administration Phase

Comments

As a suggestion, comments may include:
- The number of acres of unstable area disturbed by management activities
- Implementation of site specific prescriptions

<u>Additional BMP's of Concern</u>

		Phase Problem Occurred in:					
BMP NUMBERS*	RATING	SE	EA	CT	LO	AD	COMMENTS

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